

The AUTOMOBILE

Detroit To Make 395,050 Motor Vehicles for 1914

Automobile Factories of That City Turned Out 281,700 Machines for 1913 and Plan Big Expansion for Coming Season—Busy Plants and Prosperous Conditions Contradict False Rumors

By L. V. Spencer

DETROIT'S automobile industry, the backbone of its great growth, going to rack and ruin? Each and every one of its great automobile factories in a bad way financially? Thousands of automobile mechanics out of employment in this hub of the industry? Production of motor vehicles practically at a standstill?

These and other equally sensational rumors have been spread broadcast by the gossips of the trade—the business chameleons of the industry who change color with each passing fancy. They would have you believe that a local panic is in full swing in Detroit—that the great industry in which the city boasts of leading the world is crumbling,—that Detroit is going backward as a big business center as fast as its reverse speed will carry it.

It is high time these rumors were nailed!

Detroit's automobile industry is *not* going to the tarnation bow-wows!

Detroit's great automobile enterprises are today solid.

If any of its great army of workers are walking the streets, it is only because their employers have granted them time off to do their Christmas shopping!

The city's combined output of cars per day is greater today than it was at this time last year!

Not False Optimism

These statements are strong but none the less true. Business is undoubtedly slack in a number of the larger centers where the Wall Street control is felt. Calamity howlers of the trade in these communities have accordingly drawn long faces and out of sheer desperation sought to drag the whole of the automobile map into the web. That business lethargy is not to be found in Detroit. Its great industries are daily becoming stronger than ever before.

To get down to facts, Detroit plans to manufacture a total of 395,050 motor vehicles for 1914, according to accurate figures obtained from the various factories.

During 1913 its factories produced 281,700 motor vehicles.

These figures are the most accurate obtainable and are the result of careful compilations based upon confidential information secured from each factory individually. In many cases the figures which have been used to make the totals were ultra conservative.

In 1912 there were turned out by the Detroit plants 192,695 motor cars. This was at the time considered an enormous year's production, yet it is less than half of what is actually figured for the coming year. Let us look at the figures representing the city's car production as far back as we have records:

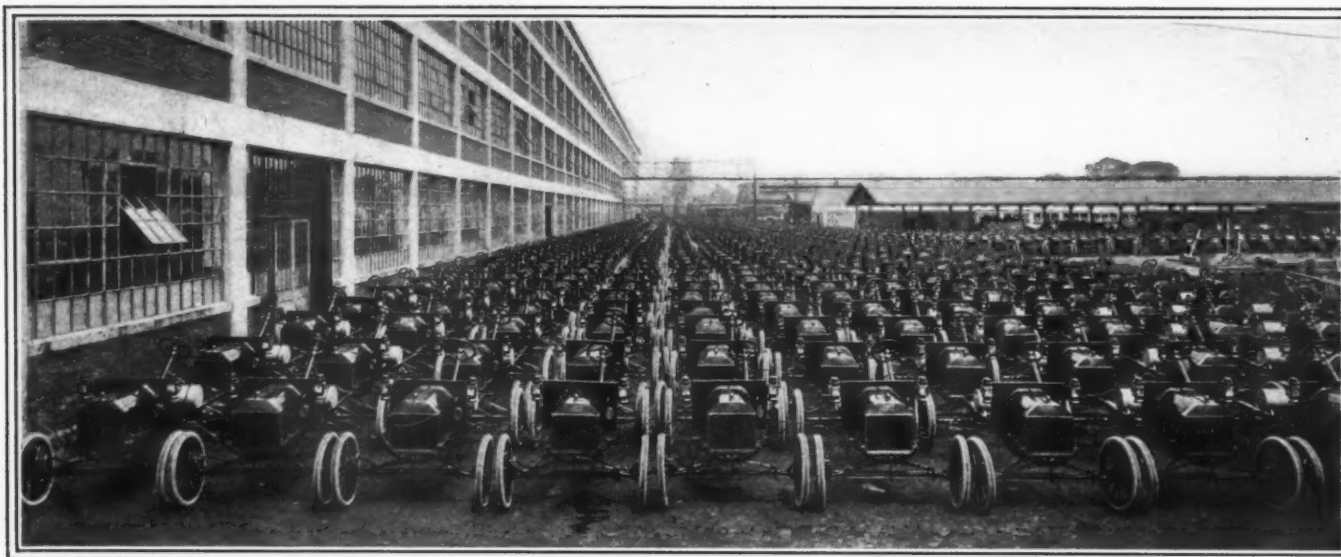
Annual production of cars—total all classes

1905	10,736	1909	45,000
1906	12,000	1910	114,120
	(Estimated)	1911	135,000
1907	15,000	1912	192,695
	(Estimated)	1913	281,700
1908	18,200	1914	395,050

It will be noted that the increase which 1914 will show over 1913 is in proportion to the corresponding increase of 1913 over 1912. Looks just as healthy as ever, does it not? Last year we heard no such pessimistic rumors concerning the city's chief industry, yet its prospects then appeared no brighter than do those for the coming year.

Ford to Make 250,000 Cars

The Ford plant, extensive additions to which are now under way, plans an output of 250,000 cars for its manufacturing year ending October 1, 1914. This large figure of course has much to do with the grand total, but subtracting it, there is still a



This hardly looks like bad times in the automobile industry. It shows 1 day's output of cars lined up in the yard outside a Detroit factory, and this aspect of prosperity is not peculiar to this plant. The other factories of Detroit are turning out more cars today than they were at this time last year, and, although their outputs do not approach that of the company referred to they represent nearly as much in value as higher prices rule among them



Fevered activity characterizes Detroit's plants throughout. The illustration shows a line of assembled chassis being given their block test. Scenes like this cannot be said to be indicative of a shaky condition of the industry, yet they are common in many of our big automobile manufacturing plants at the present time. All is activity, rush, indicating a high-pressure working schedule to be met every day—a schedule which the constant and growing demand for automobiles renders imperative. Most of the companies state that they cannot turn out the cars fast enough



Rapid internal transportation is necessary for quantity production in Detroit. Rims are carried around one factory yard on small trucks like the one shown in the illustration. Similar methods are in use in other factories in Detroit

stupendous production to be sent forth to the world. The Ford company actually produced from October 1, 1912, to October 1, 1913, a total of 181,951 cars, which means that the rest of the factories turned out for the year about 100,000 cars.

And the best part of it all is that the factories are not wasting their time in idle talk. They are turning out the cars! They are proving their statements. Most of them are surprisingly busy for this time of the year. Naturally, the production is not up to as high a mark as during the height of the manufacturing season in the spring, but it is normal. There is no slump. There is even a bigger demand for cars now than was hoped for.

At the Ford factory they are producing 700 to 800 cars a day. During last month 12,000 to 13,000 men were employed, which was more than double the number of a year ago. The payroll has not been curtailed this month either.

At the Cadillac factory, the pessimists would get another jolt. With an output of about eighty cars a day, this company is way ahead of its production schedule of a year ago. On October 29, for instance, the records show a total of 4,577 Cadillacs of the 1914 model shipped. On this date in the year previous 1,924 of the 1913 models had been shipped. Having increased its manufacturing schedule to 18,000 cars for 1914 as against an actual number of 15,007 delivered of the 1913 model, the Cadillac company is meeting its plans admirably. On December 1, it had built 2,880 of these 3,000 additional cars besides keeping up a production equal to that of last year. The Cadillac payroll contains about 7,000 names.

At the Packard plant, you would scarcely guess that it was the winter season at all. The sale for its high-priced vehicles is steadily increasing. From August 1 to November 1, the increase in Packard sales was 22.6 per cent. as compared with the corresponding period last year. During October the company shipped 152 closed cars alone.

The Chalmers company is behind in its orders. A report from this factory states that with the close of business on October 31, the biggest single month's sales in the six years during which the Chalmers company has been in business were made. The aggregate value of this month's sales was more than two and one half millions of dollars.

Maxwell Is Working Overtime

The Maxwell company is working overtime to meet its sales. It is producing 50 cars a day and soon expects to raise that by 50 per cent. daily. Even now the Maxwell company is laying its plans for the turning out of 200 or more cars a day.

Hudson is working to capacity on its sixes and could not turn out vehicles at a more rapid rate. The same is true of the Studebaker plants. Here with 7,000 men, or about 2,000 more than were employed at the same period a year ago, they cannot turn out cars fast enough to meet the orders. The Paige-Detroit factory is doing the best it can toward quantity production in its cramped quarters. Within a month it will move to its enormous new structure when the output will be more than doubled to meet the demand.

The Hupmobile factory is humming. Sales of these cars for October and November were the largest for any corresponding months in the history of the Hupp company, according to report from the factory. It is also stated that December sales will be the largest for any December since the Hupp company was established and also the largest of any month during the last 6 months.

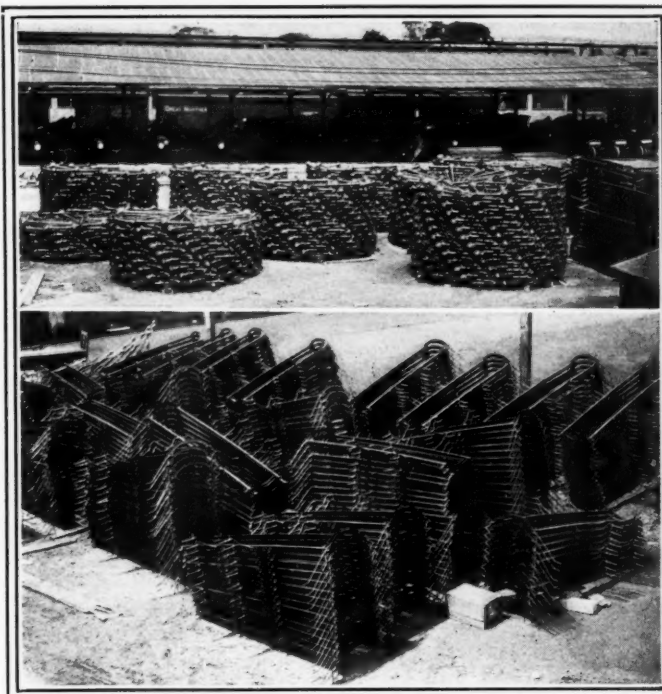
Lozier is bending all its efforts to the production of the new four and the light six. Sales of these are continuing unabated. The Regal plant is busy; the Keeton business is moving conservatively and well. At the Briggs-Detroit plant they are turning out about six cars a day. Here conservatism has always been the rule, and it is stated that the output is entirely normal for this season. In the spring, this daily schedule will be materially increased.

The Krit company has all the orders it can handle. Abbott is starting out under new management with a solid manufacturing policy and free from financial troubles. King is operating conservatively and selling all the cars it makes.

This healthy condition of all of the factories is all the more remarkable from the fact that most other lines of industry are dull just now. Go where you will, you cannot help but be struck by the solidness and permanence of the production going on around you. It would be a good tonic for some of the pessimists to spend a few days in looking over the general Detroit automobile situation.

Failures Have No Bearing on Industry

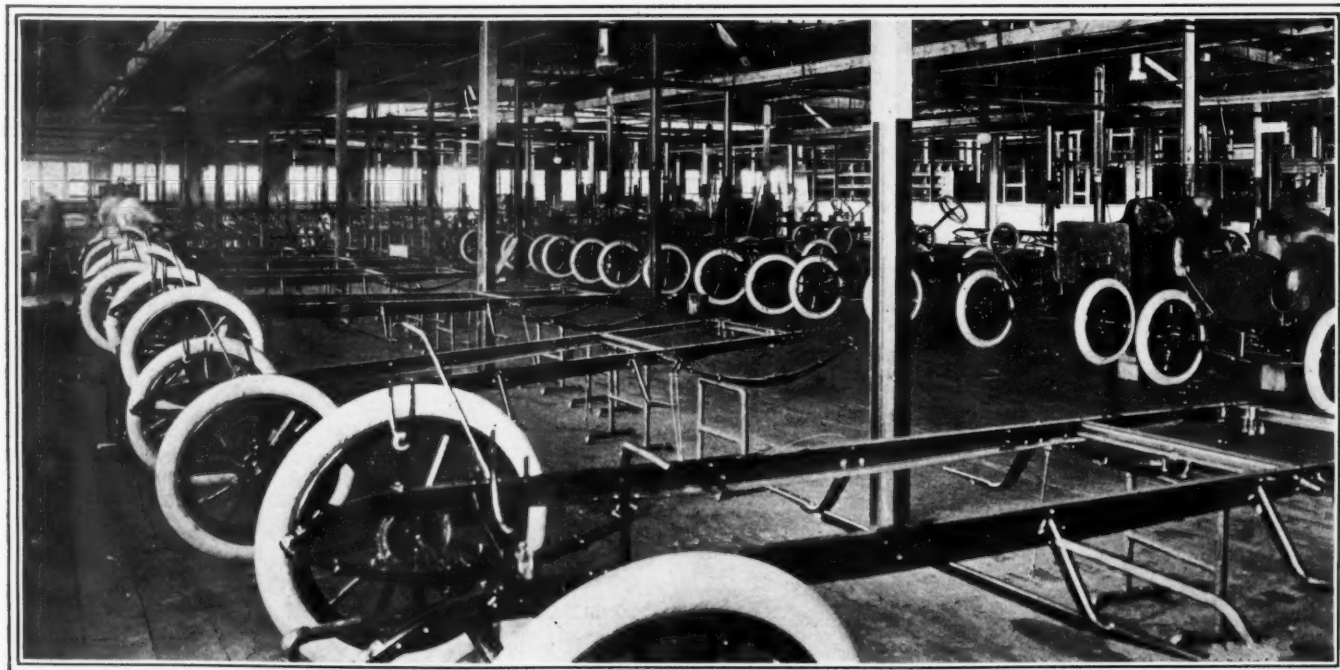
It may be that much of this talk about Detroit's "slump" has arisen from the fact that there have been a number of failures during the past year. These have all been due to weaknesses in the companies individually and have no bearing whatever on the general welfare of the industry. These badly managed and improperly capitalized concerns were doomed to failure sooner or later, and it is only to be expected that they should



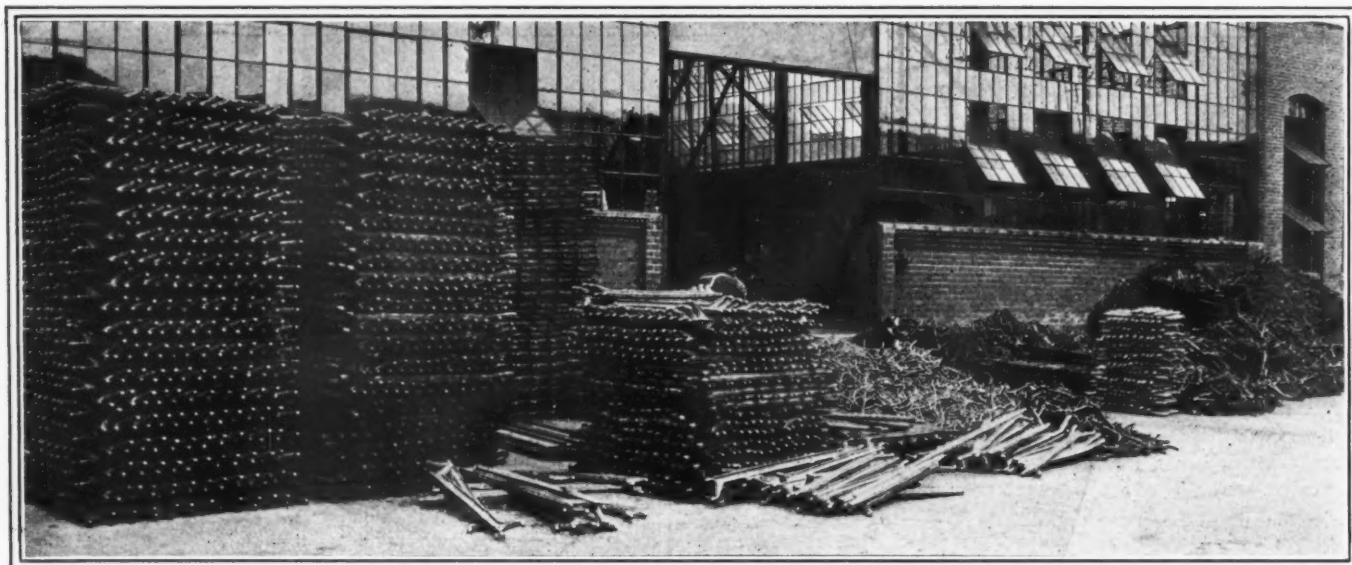
The way rear axles and frames are piled in the yard of one factory



A line-up ready for the final inspection at a big Detroit plant



They cannot get the cars out fast enough. The illustration shows the assembly room of one of the big factories



Big businesses do not stack up with parts like this when there is anticipation of a dull selling season ahead. The illustration depicts piles of front axles, speedometer drives and other parts outside a Detroit factory

have gone to the wall at a time when general business is a trifle dull.

Discussing the Detroit motor car industry of today, Howard E. Coffin, vice-president of the Hudson company, says, "It seems to me that the status of the industry here is just about as it has always been. There are a number of well-managed concerns making good cars and marketing them with a reasonable return in the way of profits upon the capital invested. There are now, as there always have been, other concerns which are not making ends meet. The same condition found in Detroit maintains in other motor car manufacturing centers, and in every other line of business for that matter.

"The fact that there have recently been a good many failures among companies engaged in the automobile business and in allied lines does not by any means reflect discredit upon the entire industry. The numerous bankruptcy proceedings would in most cases seem to indicate a cessation of the reorganization and refinancing schemes through which many of these concerns have repeatedly gone in the past, in order to keep going. Many of them operated at a financial loss ever since formation, and it is only to be expected in this present season of financial conservatism that the backers of losing ventures should refuse to continue subscribing to refinancing schemes. An analysis of practically every failure indicates troubles and difficulties peculiar to the individual company but having little or no bearing upon the progress of the motor car industry as such.

"It seems only natural," continues Mr. Coffin, "that the achievements of commercial success in the automobile business should depend upon those same foundations of conservative

business management which obtain in other and older industries. That successes along any other lines were possible in the earlier days can be ascribed to the peculiarly rapid growth of the business and to the great demand for cars upon the part of a public whose knowledge of proper qualities and values was as yet undeveloped.

"It would seem that the present conditions of the business are entirely logical—that we have been progressing toward them for a long time—and that the coming season will see the business upon a firmer and more conservative basis than ever before. With the fewer and stronger concerns in the field, it seems probable that the business of these individual concerns will be even better than during past years."

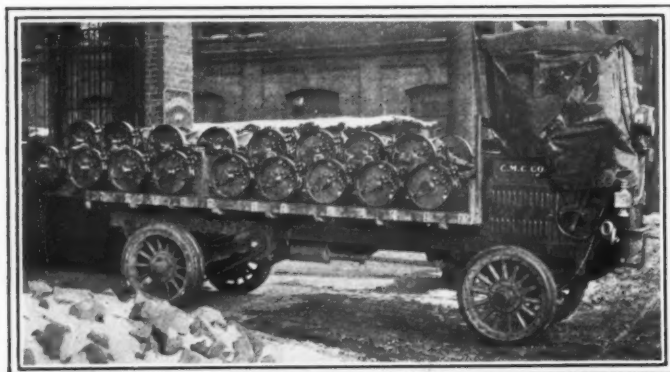
Macauley Decries Pessimistic Gossip

Commenting on the industry of Detroit, Alvan Macauley, vice-president and general manager of the Packard company, decries the great amount of gossip which is ever afloat, but at the same time takes the logical and optimistic view of the situation. He says, "As to the present status of the automobile industry in Detroit, it is exceedingly difficult to say, except as to our own business, for the reason that we believe there is no industry that is so beset with false and misleading rumors. Just why this condition should maintain is not exactly clear, except that the automobile business is so much in the public eye; but it is a fact that you cannot rely upon any information except perhaps that derived from a certified audit.

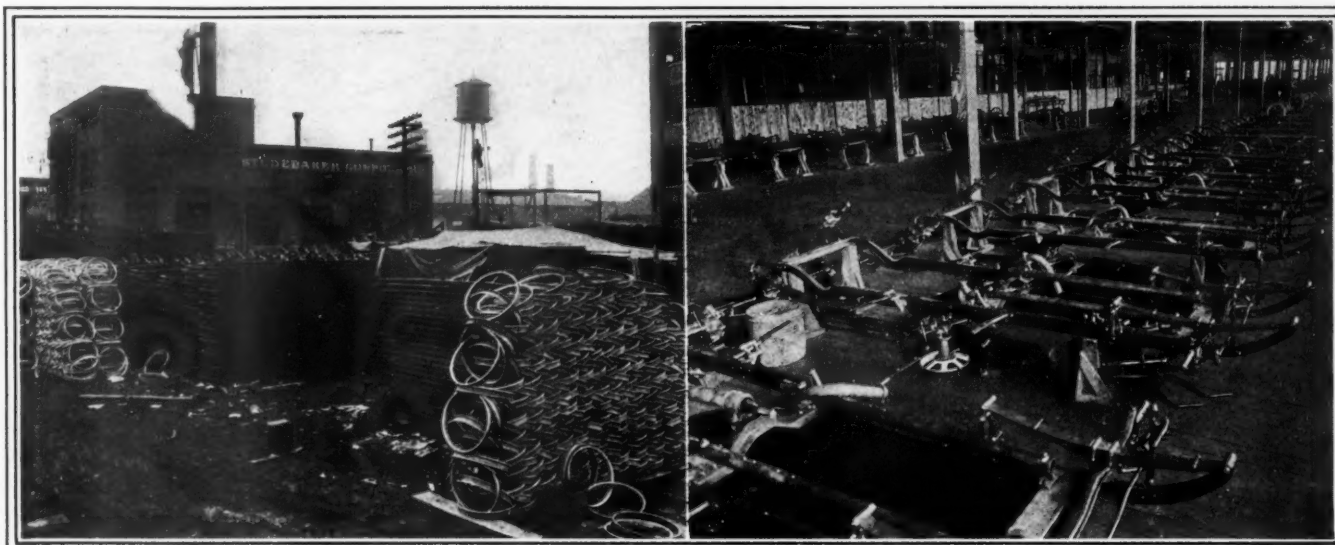
"We have no doubt that the sale of cars will continue in fair numbers during the coming year. More cars, probably, will be sold than during the past year. Certainly we expect to still further improve our volume of business."

The same ideas of a firmer industry now that the so-called weeding out process has about been finished are held by another keen business head who has long been in touch with the city's chief mainstay. Paul Smith, sales manager of the Lozier company, radiates some optimism of a thoroughly logical character when he says:

"I feel that the condition which all of us who are intimately acquainted with the industry have anticipated for 3 or 4 years back, has arrived. Those who have been in a position to know inside conditions in the automobile business for the past 3 years have repeatedly predicted that the business would resolve itself into success for a comparative few by elimination of the many who were not destined to succeed because of the lack of one or more of the necessary ingredients to success. Either lack of organization, lack of capital, failure to produce a good



The parts makers are busy, too, supplying factories. Motor trucks take the place of railroads in Detroit



Left—How frames and rims for a few thousand cars look. This photograph was taken in October and these cars are now all made up and most of them on the road. Right—Production scene in a Detroit automobile factory today

car or lack of management, or, two or more of these ingredients in combination, has caused a great many automobile manufacturers to fall short of the success mark and has forced them to discontinue business.

"The only reason in my opinion that this elimination process did not crystallize sooner was because general buying conditions were so unusually good and the demand so uniformly even or ahead of the supply that the situation was not brought to a climax until the present time. I think the weeding out process will produce much better business conditions as soon as it is over.

Weeding-Out Process Going On

"Of course, the industry will appear more or less 'shaken' and disturbed during the few months that this process is going on. Fundamentally, however, I believe the business is in better condition today and represents safer returns for the conservative company with a good product and a good organization than it ever did before in its history.

"Of the necessary ingredients to automobile success, management and organization outrank capital in my opinion, assuming, of course, as a first premise that the product is good, for, if the product is not good, you have not any foundation on which to build management or organization.

"There are still plenty of companies in the business possessing all of these ingredients and a few others for good measure. Furthermore, the people still want good automobiles in quantities and they always will. Therefore, I am conservatively optimistic."

Railroad President on the Industry

You may say that these remarks are uttered by men who are prejudiced. They are dependent upon the industry and therefore must boost it. Then take the words of a railroad president, who spoke before a gathering of business men at the Board of Commerce of Detroit, recently. F. H. Delano, president of the Wabash, declared that the Automobile City is the most prosperous in the country today.

"The only way I can explain Detroit's remarkable business prosperity in the midst of general depression, is that the automobile industry does not depend on railroad purchases, as do other industries," said Mr. Delano.

No, the automobile industry of Detroit, which gives employment to over 70,000 wage earners in the making of motor vehicles, parts and accessories, has not been built upon a foundation of quicksand, but rests upon solid rock which does not quake at the voice of the pessimist.

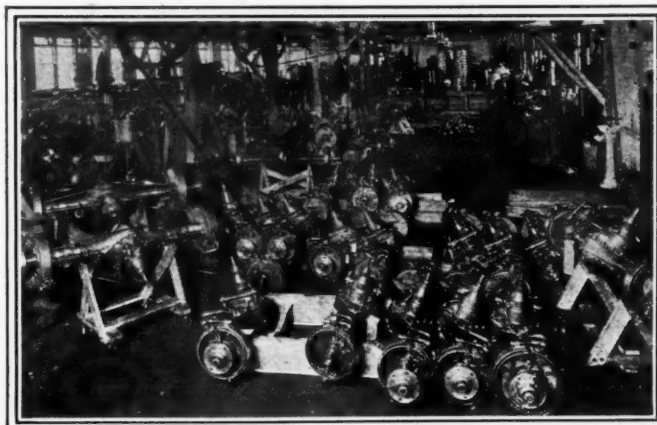
King Employees Get Big Bonus—One-Tenth of Salary Distributed

DETROIT, MICH., Dec. 20—The employees of the King Motor Car Co. were given a pleasant surprise and Xmas gift today when each one received a check amounting to one-tenth of his salary as his share in this years' profits. This gift is in fulfillment of the policy adopted by the officers and stockholders who believe that all those engaged in the manufacture of the company's cars should share in its success.

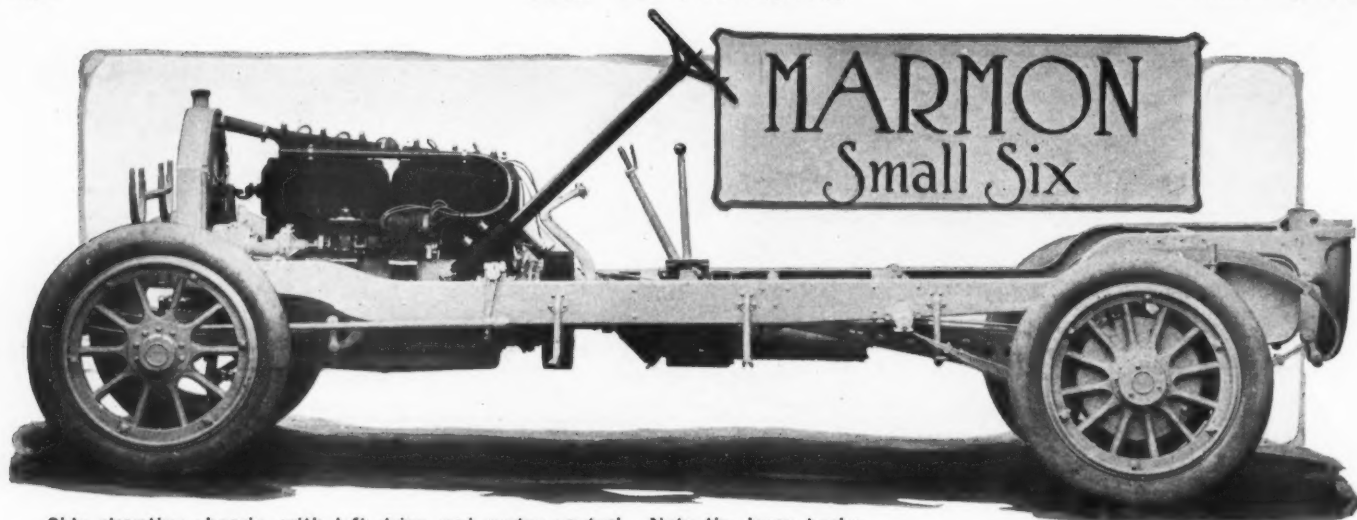
At noon the employees were assembled in one of the large rooms of the factory where one of the officers made the presentation announcing that the company had passed through an unusually successful year, was now shipping ten cars a day and in rapid development was one of the surprises of the year. Each employee received an envelope containing the company's check, after which lunch was served to all.

This action is the first in the history of the automobile industry in Detroit where the employees have shared in the profits and is the outgrowth of modern business methods.

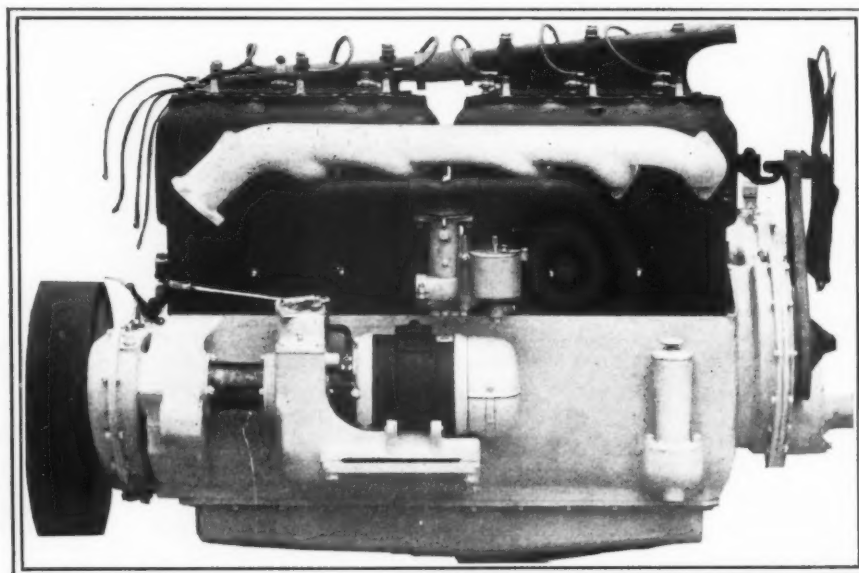
CLEVELAND, O., Dec. 1—More than one third of the electric automobiles in the state are owned by residents of Cleveland, according to State Registrar Shearer, who has completed a part of his annual report. In Cleveland there are 1,880 electrics, while the total number in the state is 4,115. In 1912 there were only 3,610 electrics in the state. The receipts for license tags for these cars in 1913 amounts to \$12,345.



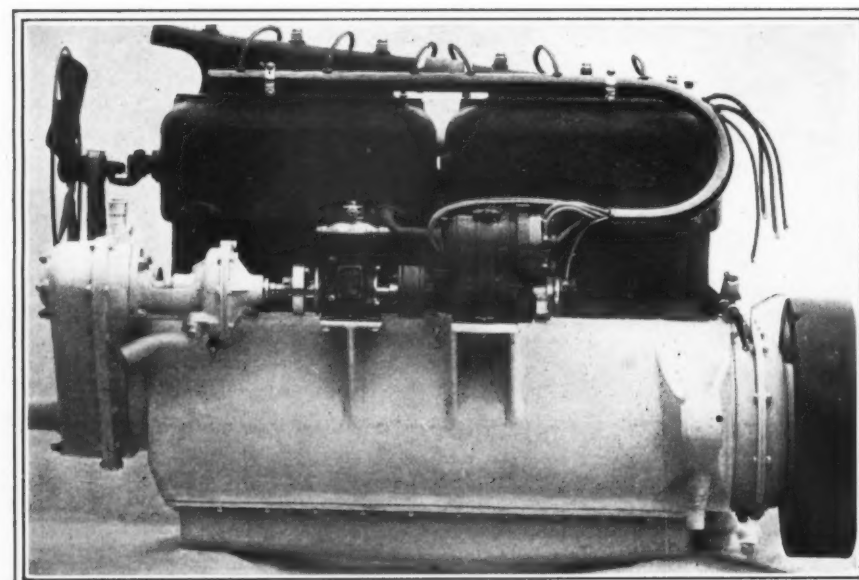
Parts production is not being curtailed. Practically every factory is rushed with work at the present time



Side elevation chassis, with left drive and center control. Note the large brake drums, frame with double kickup, deep three-quarter elliptic springs and gasoline tank suspended in rear



Right side of six, showing location of motor-generator and neat piping arrangement. The use of pressure feed allows the carburetor to be carried high and a short manifold to be used



Right side of six. The features are the conduit for the ignition wires and the series arrangement of the water pump, tire pump and magneto

New Features Include L-Head Cylinders Cast in Threes and Gearbox Located Amidships

ONE of the latest additions to the line of small six-cylinder cars brought out since the opening of the 1914 season is the Marmon small six officially designated model 41, which will be the running mate of the big six or model 6-48 as it is known, and the four-cylinder car for the coming season. Model 41 contains many features new to the Marmon line, the chief of which is that the rear-axle gearset, used in its present four-cylinder and also in its large six-cylinder model, has been discontinued and is now located amidship as a unit by itself. The new axle is a floating Timken construction with pressed steel housing.

This new Marmon six has cylinders cast in blocks of threes. The cylinder measurements 4 1-4 x 5 1-2 give a rating of 43.50 horsepower with a total piston displacement of 312 cubic inches. Both sets of valves are on one side in contrast with the T-head construction used to the present on both four- and six-cylinder Marmons.

The new six motor makes use of a particularly well designed and well made barrel type of crankcase a product of the Marmon aluminum foundry. This casting supports the crankshaft at three points on removable bearings that are placed in bored seats in the casting. Long bolts, passing through the cylinder flanges and crankshaft caps, transmit all strains direct from the cylinder to the crankshaft; independent of the crankcase proper. The intermediate bearings on the crankcase can be taken up or replaced without removing the crankshaft from the case.

The camshaft is driven by helical gears and the magneto and water pump are driven by silent chain from the forward end of the crankshaft, a double universal being provided for driving the waterproof magneto, which is of Bosch make. In addition, there is a Noil tire pump driven from the magneto universal. The magneto, tire and water pumps are very accessibly located.

Among the motor refinements which have come in for considerable attention is the lubrication of the valve mechanism. As has been the rule in Marmon engines, pressure oiling is employed, the oil being fed to all the crankshaft and connecting-rod bearings through holes in the crankshaft and likewise carried upward to the wristpin by a tube brazed upon the connecting-rod. In the new motor this arrangement is carried still farther, the camshaft being inclosed in a separate chamber and running in oil. The valve tappets and adjusting screws are drilled out so that the oil can work to the point of contact with the valve stem, thus forming an oil cushion at this point. This effectually deadens the noise and materially reduces the wear.

A particularly neat job has been made of grouping motor accessories and rendering these accessible by having the drop on the side member of the frame midway of the engine length instead of at the dash as the chassis illustration herewith shows.

Electrical equipment consists of the North East starting and lighting system. All wires are assembled in conduits connected with castings at the corners and branchings, making a complete unit which can be installed as other units. The electric light circuits are made safe with fuses and are not grounded. The connections are so made that the battery is always balanced through neutral. Electric switch connections are made to comply with all laws. The cranking motor is driven by silent chain.

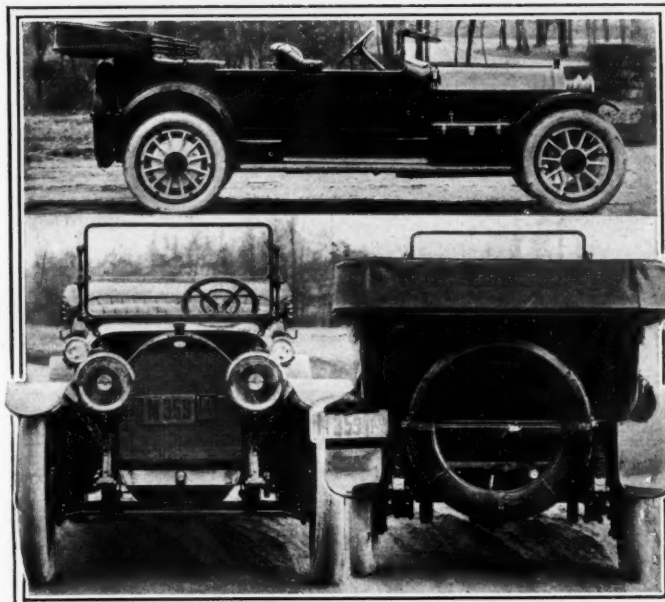
Three-Point Suspension Used

Motor and transmission are suspended at three points with a special construction designed to prevent strains from being transmitted from the frame. The motor and transmission are mounted in a line with the rear axle, an arrangement designed to reduce the wear on the universal joints to the minimum.

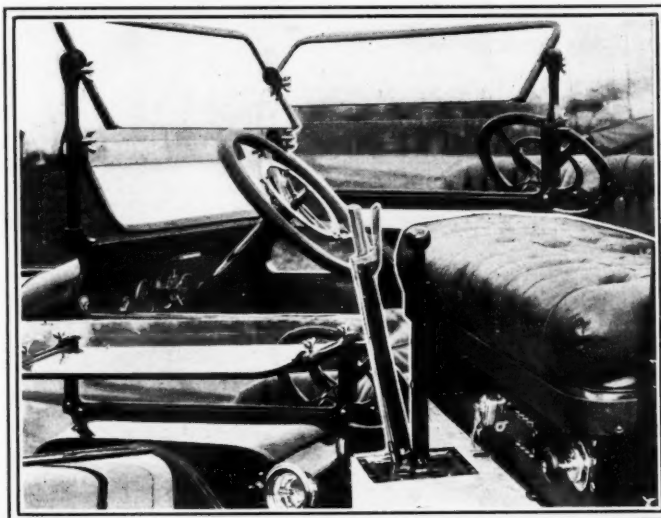
The clutch is of a cone type and a type of plain release collar that will not throw grease is used. Incidentally this type of release gives a satisfactory brake effect on the clutch and dispenses with separate devices for such a purpose.

The gearset has three speeds and the drive from the latter to the rear axles is through universals and an exposed shaft, using a separate torque member. The rear springs transmit the propelling forces from the axle to the frame. The gearshift and brake lever are mounted on a large cover plate, which, when removed without lifting the body, gives access to the interior.

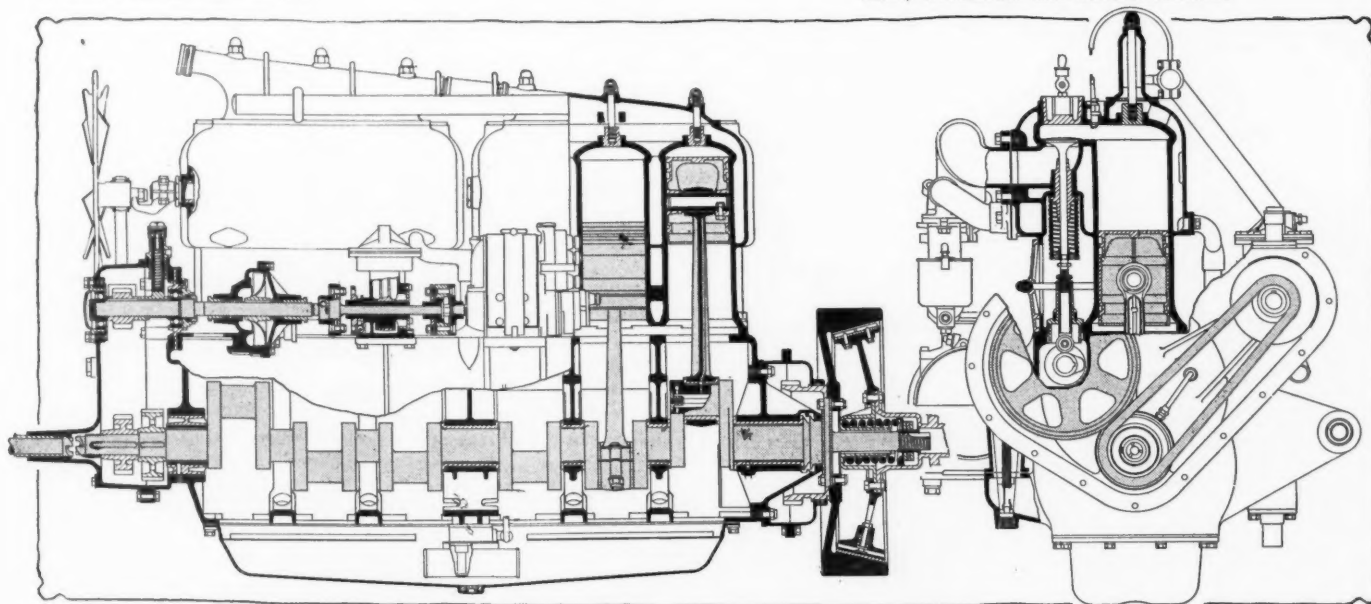
In mounting the transmission gearset in the frame, the control is operated directly through the cover, eliminating the long gear-shifting rods and excess weight on the rear tires. The torque on the rear axle is taken up through a long arm attached by means of universal spring hangers.



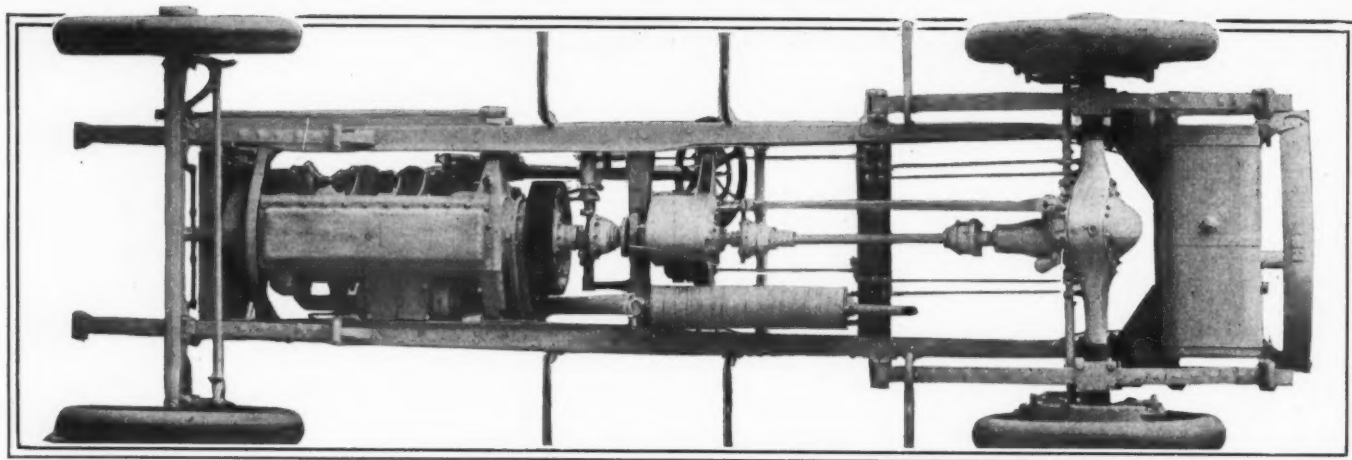
Three views of the new Marmon six



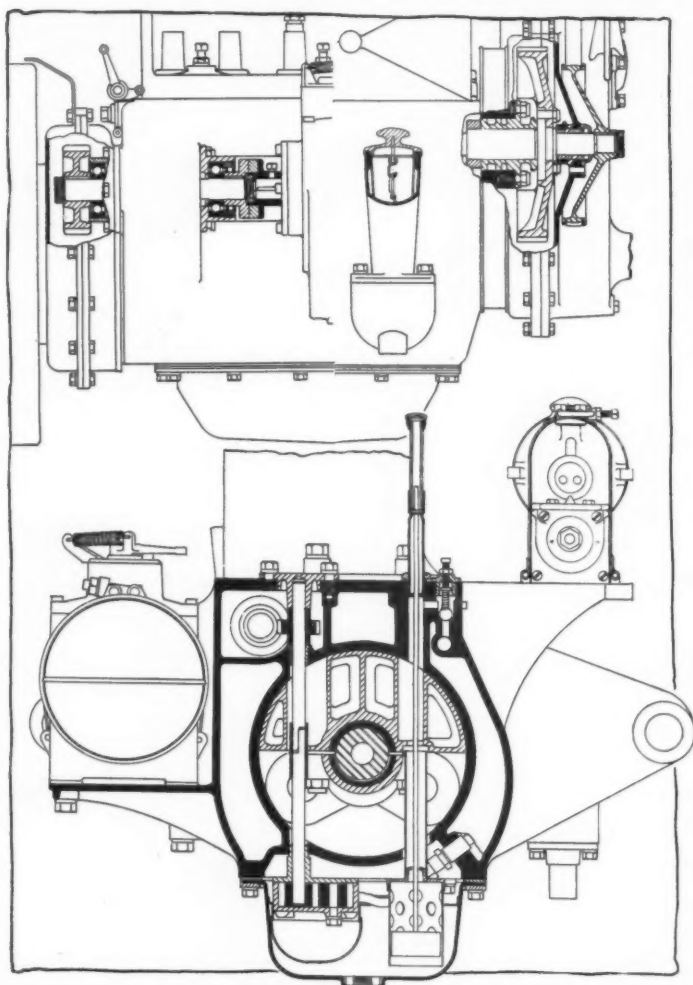
Cowl, windshield and control features



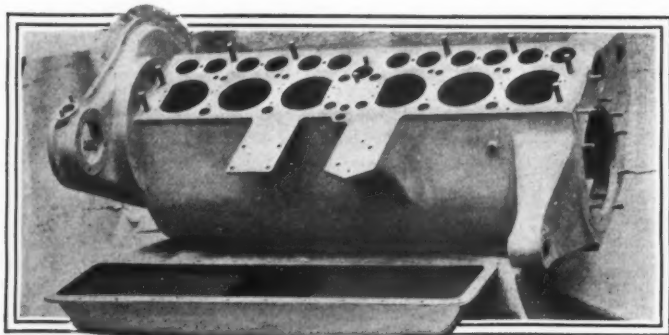
Left, side elevation and part section through motor, showing water and tire pump construction. Right, front elevation and section showing valve design, silent chain drive to cam and pump shafts and carburetor location



Under view of chassis, showing three-point suspension of motor, gearbox amidships and underslung rear springs



Upper—Side view of crankcase. Lower—Section through crankcase



Barrel crankcase, showing brackets for tire pump and magneto.

Both front and rear axles are Timkens. The gear-casing plate or cover of the rear axle is easily removed, making pinion or differential accessible. Adjustment of gear and pinion can be made while viewing the point of mesh of the teeth.

The springs are of extra length, and the three-quarter elliptic rears, 54 inches in length, are fastened under the axle, lowering the frame and center of gravity by several inches. The spring eyes are graphite bushings, self-lubricating, and the springs themselves are self-lubricating in that the leaves are formed with little pockets which carry graphite to sufficiently lubricate the springs throughout their life. The shock absorbers are mounted parallel to the side rails in which position they are actuated without being distorted.

The brakes have an extra large bearing or braking surface and are operated through an equalizing system designed to give equal and instant action on both wheels. The equalizers, with concentric rod shafts, are contained in and covered by a cross member at the center of the radius of rear axle movement, thus keeping constant the distance between lever eyes.

Model 41 in Five Body Styles

Model 41 makes its debut in five body styles—roadster, four-passenger touring car, five-passenger touring car, limousine and landaulet. Although the prices have yet to be announced, it is said that they will fall somewhere between those of similar bodies on the two older models.

In appearance, the new Marmon body has a low streamline effect and is very roomy with large carrying space. The running boards are clean the full length of the body top proper, although there is a large box just back of the rear fender on either side, one for tool equipment and the other for luggage.

The frame of the body is extended at the rear to carry the gasoline tank and tire brackets. The gasoline tank, which is hung by straps under the rear end of the frame in such a way that no extra brackets for its support are necessary. The tire carriers are designed as part of the chassis. Either one or two spare casings may be carried but an extra holder must be obtained for the second since the regular equipment calls for but one carrier.

In addition to the steel boxes on the running boards, provision for the carrying of tools, spare parts and luggage has been made by building in compartments at the front of the dash.

The dash instruments and all others are easily accessible from the driver's seat. The light switch and muffler cutout are located on the heel board, making it possible for the operator to reach them without changing his position.

Regular equipment includes a two-piece rain-vision windshield and Collins curtains, rolled up in the top out of sight but ready for instant use. Heavy wheels 34 inches in diameter are specified and are equipped with 5-inch oversize tires.



Dinner hour at the factory of the Buick Motor Co., Flint, Mich. This is one of the seven lunchrooms distributed throughout the shops. Other facilities are also offered the workmen in this plant, such as a reading room, writing room, and gymnasium

Co-Operation in the Buick Plant

Lunch Rooms, Reading and Writing Rooms and Gymnasium
Are Provided—Benefit Association Takes Care of Sick Men

CO-OPERATION and good fellowship, combined with a spirit of philanthropy worked out along systematic lines, form the basis of a most novel method of taking care of shopmen in distress at the plant of the Buick Motor Co., Flint, Mich. This company is allied with carriage builders of Flint, through the Manufacturers' Assn. of Flint, and not only takes care of its employees in illness, but also their families in case of death. The scheme is not to furnish complete support to beneficiaries, but rather to help out in a financial way in times of emergency, and in a way too, to encourage self-support.

Workmen Pay 10 Cents a Month

After an employee has been ill for a period of 13 weeks, his finances are as a rule at low ebb. To take care of such cases is the purpose of the association. The plan is to pay to the sick workman while totally incapacitated from labor, or to his dependents in case of death, a certain sum of money for a period not to exceed 104 weeks, or for partial disability from sickness a sum governed entirely by the merits of the case. The assess-

ment of each workmen per month is very low, on an average of 10 cents.

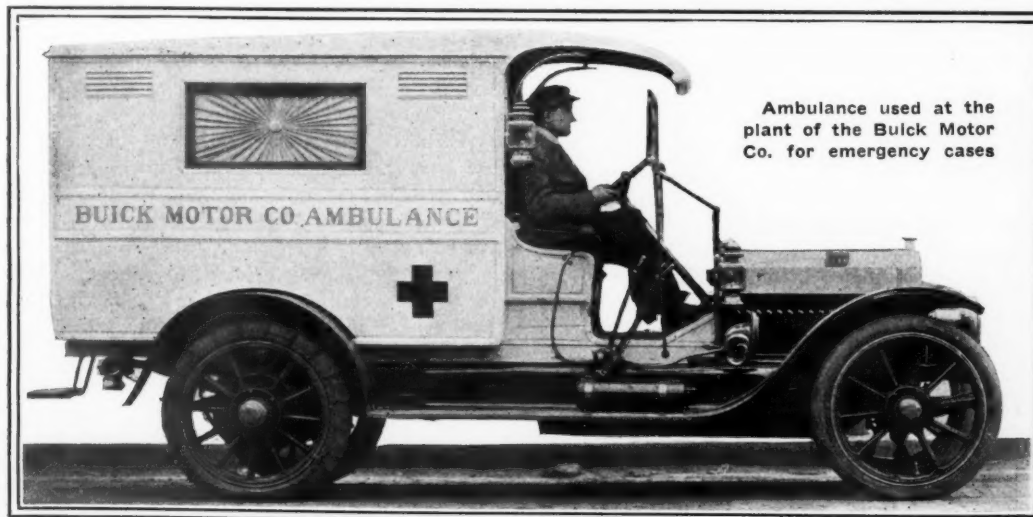
The association is housed in large and commodious quarters in the down-town district. There is a well-stocked reading room, writing room, fully equipped gymnasium, eleven pool and billiard tables, bowling alleys, and many other features to make the place attractive.

Seven Lunch Rooms Provided

At the Buick factory, facilities are afforded to the working man. There are seven lunch rooms distributed throughout the shops, with spacious wash basins and flowing water in connection, as shown at the top of the page.

Everything in and about the Buick shops is being worked out on a basis of modern sanitation. Fountains like that shown at the bottom of the page take the place of drinking cups, and the water comes fresh from the company's own artesian wells.

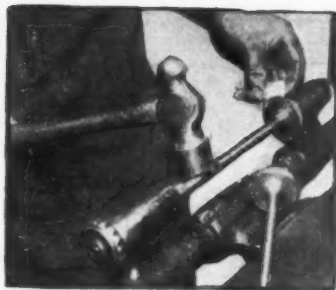
The company maintains its own motor ambulance service, and the work is reduced to the science of a fire station.



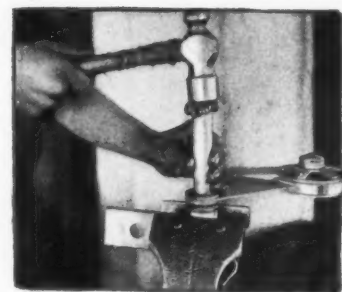
Ambulance used at the plant of the Buick Motor Co. for emergency cases



Fountains used in place of drinking cups at the Buick factory



The Rostrum



Claims That Alcohol Makes Best Anti-Freezing Mixture

EDITOR THE AUTOMOBILE:—I have read with interest the various articles relating to freezing weather and the water cooling system. I am unable to see that any other combination of anti-freezing mixture is superior to the simple per cent. solution of denatured alcohol in water. With a radiator capacity of about 2 gallons, 2 quarts of denatured alcohol at about 40 cents makes an inexpensive 25 per cent. solution good for any temperature above zero. Of course the vapor given off from such a mixture is mainly alcohol, but if one takes the trouble to determine the height in the radiator, at which the mixture should stand, so that when it is heated up it will not run through the relief pipe, the small necessary addition may be made from time to time of clear alcohol with practically no expense.

Early in the fall and late spring and when only an occasional frost is expected in the summer, if the machine is out of doors, a mere trace of alcohol will safeguard it. Up to the first of November and after the middle of April, the two quarts of alcohol will much more than protect the machine, between these dates; however, a 50 per cent. solution freezing at about minus 25 is safe to have. It frequently happens that one is quite at sea as to the actual strength of the solution in his cooling system. There is a very simple and sufficiently accurate way of getting at this, provided one has at hand the small gasoline hydrometer sold for 30 cents

and registering 60 to 80 Beaumé scale. A few inches of fine copper wire wound around the neck of the bulb to add to its weight will sink the scale into a sample of clear water. Having noted the reading, draw off from the radiator an ounce or two of the mixture and take a reading of this. If the reading is 2.5 points higher, it indicates about 12.5 per cent. alcohol in the mixture. If it is 5 points higher, it indicates 25 per cent. alcohol, if it is about 13 points higher it indicates 50 per cent. For the purpose of getting these samples of solution it would be well to substitute for one of the plugs a good pet cock spring adjusted so that it may not jar open to the confusion of the car owner upon the road. When the water system is being emptied it should be accomplished by unscrewing the pet cock and not by letting the water dribble through it. As to the starting of the car in really cold weather, with the engine close to the freezing point, there is nothing equal to drawing off the water and substituting two large kettlefuls of boiling water. At least this is true of those cars not possessing electric starters. Of course, the gasoline torch can be applied to the waterjacket of the cars using the gravity system of water circulation provided one does not mind the appearance of the part of the engine upon which it is played and is certain that there is not sufficient gasoline vapor in the atmosphere to cause an explosion.

New York City.

CHARLES E. MANIERRE.

Wants Reliability Rules Changed

Editor THE AUTOMOBILE:—I read with much interest the account of the New York 3-day reliability run between different makes of cars, as published in your last issue.

There is one point that I do not think you brought out clearly, and that is, that three cars are not stock cars. While they may be exactly the same kind of car that one will see in the sales-room, and which are delivered, yet the extra work that is put on them would account in a great measure for the efficiency as shown in the test.

For example, a car turned over to me last spring by one of the companies in the competition has never performed up to the average, although it has been sent back to me from their experts four different times, and stated by them as being in perfect condition. As a matter of fact, it is not assembled properly, and never will be a first-class car.

I think that there is too much "tuning up" in these tests, and, as a purchaser of cars, allow me to suggest that the next time a test is made, a committee go to the stock rooms and pick out the cars, and then run them in the condition that they are turned over to the purchaser. There will be a few surprises.

New York City.

WILLIAM PROCTER.

Main Bearing Adjustment on E. M. F.

Editor THE AUTOMOBILE:—Will you please tell me how to take looseness out of the end bearings of my E. M. F. 30?

Detroit, Mich.

W. F. B.

—The front bearing on the E. M. F. motor is a one-piece bushing and is therefore non-adjustable, but a new one can be obtained at small expense from the Studebaker Corp., Detroit, Mich. The rear bearing is split horizontally and can be taken up, providing that it is not too badly worn, otherwise it will have to be replaced. If the bearing is merely worn smooth, giving the looseness without any bad scoring of the bearing material it may be taken up by removing one or more laminations from the shims between the bearing cap and the bearing. This will cause the cap to draw more tightly up to the bearing and will cure the looseness. If there are no shims the same effect can be obtained by filing some metal from the face of the cap, thus making it fit more snugly down over the bearing. Care must be taken that too much metal is not removed from the surface of the cap or the bearing will bind and will soon become so hot that the bearing metal will melt.

If the bearings are slightly scored, but not too deeply, they may be scraped to a new fit by painting the crankshaft with red

lead, setting it back in its bearings and after tightening the cap slightly, giving it a few turns. The crankshaft should then be removed and the high spots on the bearing will be detected by the presence of a coating of red lead. These spots should be scraped off with a bearing scraping tool, a rounded knife or a chisel blade. Great care has to be taken in scraping off the spots not to remove too much metal and thus leave hollow places where the high spots were. The operation of putting red lead on the crankshaft, spotting the bearing and then scraping should be kept up repeatedly until a perfect fit is secured. When the fit is good, the high spots indicated by the red paint will become small and very evenly distributed and the red lead will be found to come in contact with practically the entire bearing.

If the bearing is so badly worn that a new one is necessary, the new bearing should be scraped in by this same method.

Worn Cylinders Cause Waste of Oil

Editor THE AUTOMOBILE:—We are the owners of two 1912 Alco motor trucks, with 5 by 6-inch motor. One uses 1-2 gallon of oil every 100 miles, while the other requires 3 or 4 gallons every 100 miles. We put in new piston rings, which give very good compression, and tried everything to remedy it, but cannot. It seems to us that the oil burns. The motor makes a lot of smoke, and gets full of carbon.

2—We have an idea of using leakproof rings. Kindly tell us about them.

Central Falls, R. I.

COUTU BROS.

1—The high oil consumption which is obtained on one of your trucks is undoubtedly due to worn cylinder parts and the remedy you will employ will depend largely on how badly worn the parts are. In the first place it may be that the new rings you have put in have not been fitted properly and that as a result the oil is carried up into the combustion chambers in comparatively large quantities, although the rings fit well enough to give good compression. The rings should be lapped to give a good fit.

However, new rings may not be sufficient to prevent the oil being wasted; it may be necessary to fit slightly larger pistons, which can be obtained from the Alco Service Station, Long Island City, N. Y. The pistons should be lapped.

If the cylinders are badly worn it will be necessary to rebore them enough to bring them back to a true cylindrical form. This operation will not remove enough metal to weaken the cylinders appreciably. After reboring, larger pistons and rings will be needed and of course it will be necessary to lap them to a fine finish.

2—Leak-proof rings are made by the McQuay-Norris Mfg. Co., St. Louis, Mo. Each ring is made in two parts and these are fitted together so that the split ends of the two ring members come on opposite sides of the pistons, the advantage of this construction being that that gas in leaking past the ring must travel past the ends of the top, half, then work its way half way around the piston between the two ring members to the split in the lower half.

A New Way to Straighten Valves.

Editor THE AUTOMOBILE:—I have read several interesting letters on methods for straightening valve stems and note that in most cases the straightening is effected by the liberal use of the hammer. It seems to me that it is rather difficult to gauge the hammer blows and that there is danger of bending the stem in the other direction. To overcome the difficulties of straightening a valve in this fashion, I have used the simple apparatus indicated in Figs. 1, 2, and 3. It consists of the frame shown in Fig. 1, in which the valve is held between centers on two nails and where it is spun to determine the high side of the stem. The high part of the stem is marked by a piece of chalk, and then the valve is bent straight in a clamp or vise. Of course where a lathe is available the valve may be placed between the lathe centers, but the device shown in Fig. 1 is a makeshift that anybody can make and use.

Fig. 2 shows the method used in straightening the valve by

means of a clamp and Fig. 3 indicates how it is done in a vise. In Fig. 2 a stiff metal plate is laid on top of the screw cap and two soft metal bending blocks are placed on it. The rigid bending hook is provided with a soft metal piece so that the valve stem will not be marred by it. The valve is inserted as shown in the figure and sufficient pressure applied by means of the thumbscrew to straighten it out, when it is again tested in the apparatus shown in Fig. 1.

Fig. 3 shows how a vise may be used if a clamp is not at hand.

Of course, these devices are crude in a way and it is possible to make a more permanent design, but it was my aim to show a simple means for taking the kinks out of valves, one that any amateur can employ.

New York City.

W. F. SCHAPHORST.

Franklin Valve Timing

Editor THE AUTOMOBILE:—1—Will you please publish the valve timing, size of valves and lift of the Franklin four-cylinder 30 and the small six of 1913?

2—What effect does the size of the cylinder have on the valve timing, everything else being the same?

Play Center, Kan.

GUY LAIRD.

1—The Franklin company is not making a four-cylinder 30 for 1913. The timing of the small six is as follows, these measurements being taken on the flywheel rim: Inlet valve opens 1.1875 past upper dead center and closes 5.25 inches after lower dead center. The exhaust valve opens on top dead center and closes 2.125 inches after lower dead center. The diameter of inlet and exhaust valves is 1.53125 inches, and the lift of the inlet valve .28125 inches and of the exhaust valve .25 inches.

2—Cylinder size has very little to do with valve timing as this depends largely on the motor speed, although the size of the valves and the lift is directly determined by cylinder size.

Jump Spark Ignition Systems

Editor THE AUTOMOBILE:—As I am interested in the automobile business and would like to get a thorough knowledge of jump spark ignition systems used on automobiles, I would be very grateful if you will explain where the different wires run and their different operations, from battery to spark-plug.

D. B. RONDELL.

—There is such a wide variation in the different ignition systems on the market that it is impossible to make one description fit them all. On the other hand, there are too many systems to allow us to describe all these in detail, because of lack of space. The best we can do is explain the principles of operation of the common types of ignition apparatus and with an understanding of these principles it will be possible for you to study out the details of any particular make in which you may be interested.

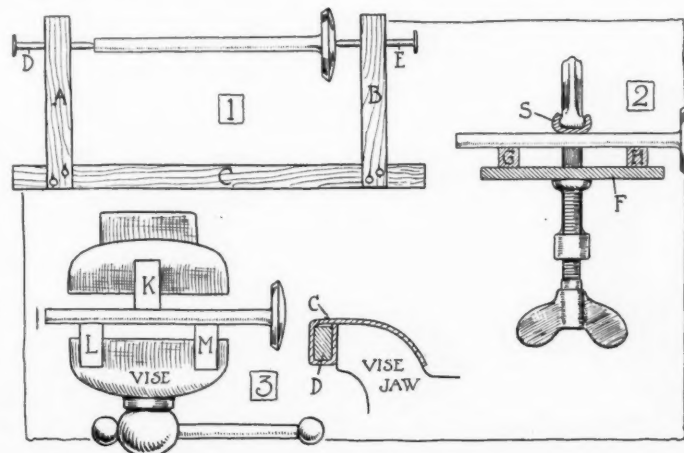


Fig. 1—Apparatus for truing valve up. Fig. 2—How to straighten valve by means of clamp. Fig. 3—Method of using vise as a valve straightener

Broadly speaking all the systems are the same in that they have a low voltage current source, and a device called an induction coil for raising the voltage to a point where the current will jump across the gap between the spark-plug points. The low voltage part of the circuit is known as the primary and the high potential part as a secondary. As will be seen later, these two circuits have no electrical connection, but are linked together by a magnetic force. The reason for using an induction coil is that there is no available apparatus that will give the high voltage required for jump-spark ignition directly. Current may be obtained from dry cells, storage battery or an electric generator.

For simplicity's sake a system for a one-cylinder engine will be taken up first. As illustrated diagrammatically in Fig. 4 the current from the battery passes through the primary coil which is composed of several turns of coarse wire which surround an iron core. The primary circuit is indicated by the heavy black lines. Around the primary coil is another one composed of a large number of turns of finer wire which form the secondary.

When the primary circuit is made or broken the resultant sudden rise or fall of current flow induces a high electromotive force in the secondary winding. This is due to the fact that whenever a current passes through a conductor, a magnetic field or influence surrounds the conductor and its strength is proportional to the quantity of current flowing. When the circuit is closed the current rises from zero to its normal value and when the circuit is opened it drops back to zero again. Corresponding with this rise and fall there is a fluctuation of the magnetic influence or lines of force surrounding the conductor. This changing magnetic influence is what induces the high voltage in the secondary circuit.

Now that a general idea of the jump spark ignition has been obtained the apparatus for a one-cylinder engine, Fig. 4, will be described in detail. It is composed of a battery timer which is driven by the engine at one-half the crankshaft speed and an induction coil, the latter including a trembler for quickly breaking the circuit and a condenser which prevents sparking at the trembler points. As is shown by the diagram, the current flows from the battery to the timer shaft, the roller on this shaft making contact with the segment in the right side of the timer at the proper time. From thence current passes out along the trembler up through the contact screw and then down through

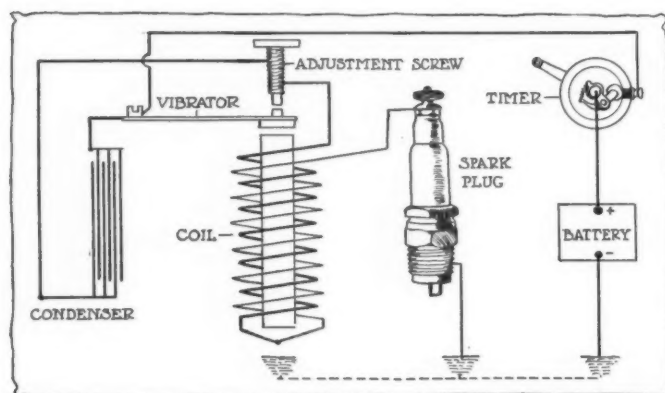


Fig. 4—Simple jump spark ignition system for a single cylinder engine

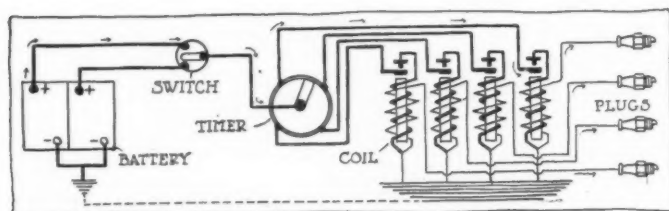


Fig. 5—Unit coil system for four-cylinder engine

the primary coil to where it is grounded on the frame, the frame supplying the necessary metallic connection between this point and the other terminal of the battery which is grounded.

The operation of the trembler is accomplished as follows: As soon as current flows through the primary circuit, the iron core becomes an electro-magnet and attracts the trembler away from the contact screw, thus breaking the circuit. The instant this occurs, the magnetic force in the coil dies down and the trembler flies back against the screw. This cycle is repeated as long as the circuit is closed by the timer and every time the circuit is made or broken by the trembler a spark jumps across the spark-plug points. The path of the current in the secondary is simple, the electrical energy flowing to the spark-plug down through the central electrode to the end, where it jumps across the gap to the shell of the plug. From here the circuit back to the secondary or high-tension coil is completed through the engine and frame, as indicated by the dotted line. Spark is advanced by rotating the timer casing on its shaft.

The application of any kind of a jump spark system to a multi-cylinder engine requires a distributor which runs at one-half crankshaft speed, either in the primary or secondary circuit as shown in Figs. 5 and 6 respectively. The former type, Fig. 5 will be taken up first, an examination of this diagram showing it to be similar to the simple system described for a one-cylinder engine, the main difference being that the timer now has four equally spaced contact segments, the wires from which lead to individual induction coils. From these four coils the high-tension current is led to the spark-plugs, as indicated. In this diagram the timer not only times the flow of current but distributes it to the proper cylinder as well.

The operation of this system is identical with that previously described, current flowing through the timer brush to whatever segment the brush is in contact with and from thence passing through the primary trembler and coil to the engine frame, the secondary current flows directly from the coil to the spark-plug. It will be noticed that a common ground wire is used for the free ends of the primary and secondary coils. Spark advance is obtained, as before, by rotating the timer casing.

Using one battery continuously for any length of time reduces its life, so it is customary to fit two batteries and after operating on one for a while, the other can be put into service. This is accomplished by the two-way switch shown in Fig. 5 and which is generally located on the coil box. The system just described is known as the four-unit coil system.

Fig. 6 shows the other method of adapting the simple single-cylinder system to a four-cylinder motor. This is done by distributing the current from the secondary side. This system comprises a timer, a master coil with vibrator and condenser, and a distributor, and its operation is exactly the same as the first one except that a distributor is inserted in the secondary circuit.

It is possible to do away with the magnetically operated trembler by using a mechanical breaker Fig. 7 driven by the engine shaft. This device not only acts as a breaker but accurately times the spark as well and for this reason must be positively driven from the crankshaft by suitable gears, the same as the timer is. If a mechanical breaker is used in connection with the battery it is necessary to make the time of contact very short if battery economy is to be secured.

This brings us to a consideration of the magneto, as this device is nothing more than that illustrated in Fig. 7 with the current supplied by a magneto generator. The current is produced by the rotation of the armature between the ends of horseshoe magnets, Fig. 8 the armature core being made of iron and slotted to receive several turns of coarse copper wire. The rotation of this wire in the magnetic influence that exists between the ends of the magnets cause an electric current to be generated.

The induction coil may be separate from the magneto or may be wound on the armature outside of the primary coil in which the current is generated. The latter system will be described.

In Fig. 9 one end of the primary winding which is shown by the heavy lines is grounded on the armature core and the other is connected to the contact block A, the circuit being completed through the contacting arm B which is grounded on the casing. The current flow is through the primary coil, the circuit-breaker and is completed through the engine and frame.

The path of the current from the primary is through the contact breaker, through the magneto frame, back to the grounded end of the primary coil. At the proper time, the circuit is broken by the roller on the contact breaker coming in contact with the rollers C in the breaker casing, at which time a spark occurs in one of the cylinders.

The grounded end of the secondary winding is connected to the live end of the primary so that one winding forms a continuation of the other. The secondary coil is indicated by the light lines. One end of the secondary leads to the collector ring D from which a carbon brush takes current to the brush on the distributor. From this point the current passes through each segment in turn to each of the four cylinders. Spark advance is obtained by varying the time at which the breaker is actuated and this is done by rotating the breaker casing.

It is easily seen that many combinations of the simple systems described are possible, but lack of space prevents us from going into this phase of the subject.

Interested in Rotary Valve

Editor THE AUTOMOBILE:—I have in mind a tubular port revolving valve for an automobile engine and in explaining it to my engineer and repair man, he said he thought you had published some similar device in THE AUTOMOBILE within the last year or so, but he could not remember the time of the article. If you have printed in the past any such device, and could furnish me with such information I would be very much obliged.

Williamson, N. Y.

E. H. LAPP.

—The article to which you refer was probably the description of the Mead six-cylinder rotary valve motor which appeared in the issue of THE AUTOMOBILE of January 16, 1913, page 229. In this motor, one long cylindrical valve extending the full length of one side of the cylinder casting is used for opening the inlet ports and a similar valve is located on the other side for opening the exhaust ports. These valves are driven by a chain from the crankshaft.

Strain Borne by Bevel Gears

Editor THE AUTOMOBILE:—Is there any more strain on the bevel driving gear on first speed going up a hill, towing another car or any strain a car may be put to, than if the car was in high speed. Which is greater the strain on high or low speed or is the strain the same?

Flushing, L. I.

READER.

—The driving stress imposed on bevel gears is entirely independent of the horsepower transmitted. That is to say, if it takes 30 horsepower to drive a car up a steep hill on low gear, the gears will be no more strained than if the same car were driven along the level on high gear at such a rate as to require 30 horsepower to be transmitted. However, the strain imposed on these teeth is greater when the car is pulling up a very steep hill on low gear than when the machine is running on high gear, at the same speed.

Agencies in Washington

Editor THE AUTOMOBILE:—I would like you to publish in your next issue the makes of cars that have no agencies in Washington, D. C., and their address.

Washington, D. C.

G. E. S.

—As the makes of cars in the United States run up into the hundreds, lack of space prevents us from answering your question directly, but below is a list of the automobiles that are represented in your city and by comparing this list with that given in *The Automobile Trade Directory*, you can easily find the names and addresses of the cars that are not represented in Washing-

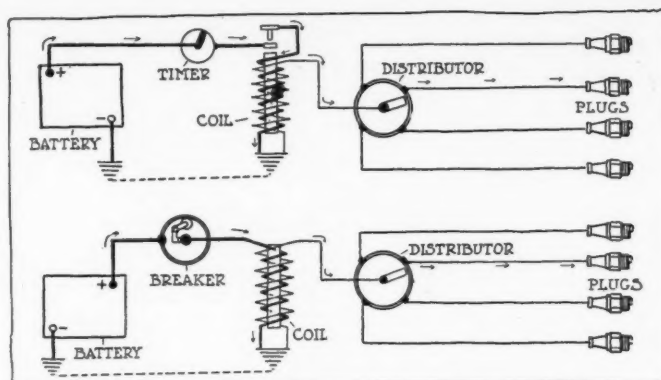


Fig. 6—Upper master coil used in connection with distributor for a four-cylinder

Fig. 7—Lower, same system as in Fig. 6, but with the breaker taking the place of the timer and trembler

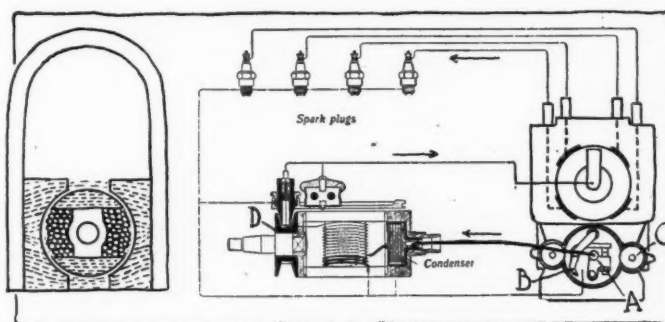


Fig. 8—Left, section through magneto, showing armature and windings

Fig. 9—Right, high-tension magneto ignition system

ton. The cars represented are: Apperson, Detroit electric, Chalmers, Reo, Studebaker, Overland, Ford, Chevrolet, Maxwell, Mitchell, Rambler, Stevens-Duryea, Marion, American, King, Pullman, Standard electric, Palmer-Singer, Cole, Paige, Hupmobile, Oldsmobile, Oakland, Buick, Stutz, Franklin, Locomobile, Cadillac, Baker electric, Rauch-Lang electric, Packard, Marmon, Woods electric, Pierce-Arrow, Indiana truck, Wilcox truck, Metz, White, Haynes, Little Giant truck, Autocar, Lozier.

Balancing a Two-Cylinder Motor

Editor THE AUTOMOBILE:—How is a two-cylinder, four-cycle gas engine arranged so that the crankshaft will be balanced and the power strokes occur at regular intervals?

If the two connecting-rod bearings on the crankshaft were on opposite sides of the center, thus balancing each other, the explosions cannot be arranged to occur at regular intervals.

Glen Ridge, N. J.

P. S.

—The method used to secure evenly spaced power strokes on a two-cylinder motor is to place both pistons on the same crankshaft throw, but this construction has been rarely used because it gives such poor balance of the reciprocating parts. It is much better to place the throws 180 degrees apart and thus secure better balance at the expense of unevenly spaced explosions. In this case, one explosion occurs 180 degrees after the other and then there is a wait of 540 degrees or a revolution and a half before another power impulse is obtained.

Objects to Narrow Radiator and Sloping Hood

Editor THE AUTOMOBILE:—The almost universal adoption of the streamline body with narrow radiator and sloping hood and the wild claims made about its beauty move me to say a few words against it. This design gives an unbalanced looking car, thin at front and absurdly wide at the rear. The narrow radiator is all right on a racing car, but of no advantage on a touring car where high speed is not desired.

New York City.

H. F. B.



The Engineering Digest



Small Recent Improvements of Gas Turbines Give Little Promise of Immediate Practical Applications

DATA ON MATERIALS FOR TURBINE MOTOR PARTS

SOMEWHAT in the distance, so far as the immediate and practical interest is concerned, the gas turbine haunts the engineering mind by the promise of a simplicity which with reciprocating pistons is scarcely conceivable and a uniformity of torque which can only be approximated in the standard motors by a series of engines working on the same crankshaft; and the rotary aviation motors, which are not properly turbines, have indicated that the low fuel efficiency which has so far marked all engines of the rotary type—even the steam turbine at low speeds—may be overcome, or partly overcome and partly offset, by compactness and other special advantages too complicated for mention at this point.

It is perhaps the general feeling that something very essential is still lacking in all the efforts which have been made at materializing the practical gas turbine and that some day, through the stroke of inventive genius, this lacking feature will be supplied, whereafter progress in working out the details will follow by leaps and bounds as has been the case with the adaptation of the gas engine to liquid fuel and the development of automobile and aviation motors, on one side, and Diesel motors, on the other side, from the first crude gasoline motors, which were conceived, by the way, largely with a view to utilizing the cheap and practically wasted by-product which gasoline at that time was. But, in accordance with Güldner's maxim: "Invent less, design more," it is likely that the stroke of genius for which the engineering world is waiting with regard to gas turbines will come from somebody who has studied closely all that others have done before him. Combustion turbines of very large size—1,000 horsepower and more—have already been built and operated, and the efficiency figures quoted for them have seemed very satisfactory for a beginning; but they shall not be repeated here, as efficiency tests for experimental engines are notoriously deceptive. On the other hand, neither combustion turbines of small power nor explosion turbines of any size have as yet impressed the practical mind very deeply. The difficulties encountered have constructively related very largely to the compression of the fuel mixture and to the tightening of joints, but those arising from the giving out of material under the high heats and speeds of the parts have been of hardly lesser importance. A marine consulting-engineer, Schulz, gives in *Der Motorwagen* a resume of the latest constructions of combustion turbines, together with a full list of the sources of his information, which may be of value to students of the subject, and announces an article treating explosion turbines likewise. He also reviews the question of materials. The more important facts and observations noted by this author are herewith reproduced with special reference to features which may be applicable to small as well as to the large stationary motors in which the industrial interest is mostly centered at present.

The compression of the fuel mixture is usually effected by first compressing the air by means of centrifugal blower similar in action to the multiple centrifugal pumps used for fire engines, and injecting the fuel into this compressed air just

before it is admitted to the combustion chamber. As, however, the total efficiency of the turbine is influenced strongly by the difference in the tensions of inlet and outlet gases, it has been proposed to increase this difference by using not only a turbine-compressor for the air entering the main turbine but also a suction pump acting on the exhaust. By the arrangement shown in Fig. 1 the air and the fuel gas—being used in this case rather than a liquid fuel—are driven through separate tubes through the pre-heater and thence to the combustion chamber adjacent to the expansion nozzle of the turbine. The exhaust gas is discharged among the tubes of the pre-heater and drawn off by the suction pump. The best effect is obtained when the compression reaches 6 atmospheres and the suction is that of 1-5 atmosphere, so that the proportion in the pressures becomes that of 30 to 1. Even so, however, the total efficiency of the arrangement, which is also cumbersome and complicated, does not get above 11 per cent, with a temperature of 450 degrees centigrade in the turbine, or 20 per cent. if a temperature of 600 degrees is generated, according to calculations by Stetefeld. If the plant is small the turbine will barely turn itself over while doing the compression and suction work.

Compressors of the so-called free-piston type have been designed by Thompson & Webb, Braun, Matricardi, Bugnot, Pecheur, Hill & Holroyd of Gynostatic Turbines, Ltd., Horch & Co., Blake, Freytag & Baumann, Humaran, Brown-Boveri and Dr. Zselyi. In the construction by Humaran, and Brown-Boveri the free piston is replaced by an oscillating mass of water, acting as the same feature in the Humphrey pump.

Fig. 2 shows the arrangement of the plant. When the explosion in chamber *b* drives the oscillating mass of water *a* down at one end it rises at the other end and compresses the air previously drawn into the compression chamber *d* through pipe *c* and drives it through pipe *e*, pre-heater *f* and pipe *g* into the combustion chamber *h* of the turbine. After taking action in the turbine *i* the burnt gases escape by way of the pre-heater interstices to the exhaust pipe *n*. The turbine drives an electric generator *m*, but the economical results of the plant have not yet been made known.

At the technical highschool at Budapest Dr. Zselyi employs a solid free-piston compressor in connection with a two-cycle motor. The fuel mixture is driven alternately into one and the other end of a long cylinder, entering through valves in the piston rod which passes through the cylinder. The explosion takes place by electric contact, whereafter the exhaust valve opens at the middle of the stroke. The piston, continuing its travel, draws

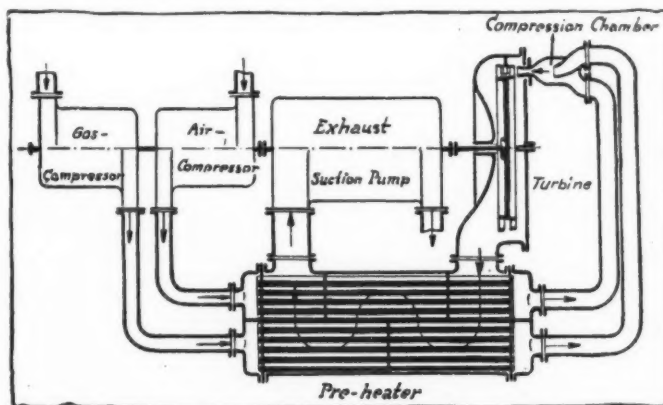


Fig. 1—A desperate method for raising turbine efficiency

in a new charge after the exhaust has been closed, and then the explosion from the side takes place, acting to compress the new charge at the same time. A speed of 240 double strokes per minute has been recorded, but otherwise the results have not been published. The compressor apparatus, which would be applicable to a turbine, has the disadvantage in common with other solid free-piston devices that the faces of the piston and the valves are exposed to high temperatures and that a considerable percentage of the energy from the explosion is diverted to the compression work. In an apparatus by Lehne these disadvantages are to some extent avoided. Its plan is shown in Fig. 3, where *a* is a wheel whose circumference is formed of cells open inwardly and outwardly and which turns in the housing *b* on a central shaft. The pipes *c* and *d* form two closed circuits into which, by the turning of the wheel, air is thrown from the center outwardly, so that fresh air can follow through pipes *c* and *d*, respectively. Pipe *c* is constantly heated from the exhaust and pipe *d* is cooled, and by the cooling a depression takes place which makes fresh air enter at *f* while the heating of *c* causes a discharge at *e*. The discharge air is led through a cooler and from this to another heating chamber, and by this stepwise process a considerable compression is obtained.

The injector principle for the compression of the air and the gas is being tried by Crossley & Atkinson, Braun, Armengand-Lemale, Deschamps, the British Thompson-Houston company and by Ahlquist, but while the injector system is usually reliable

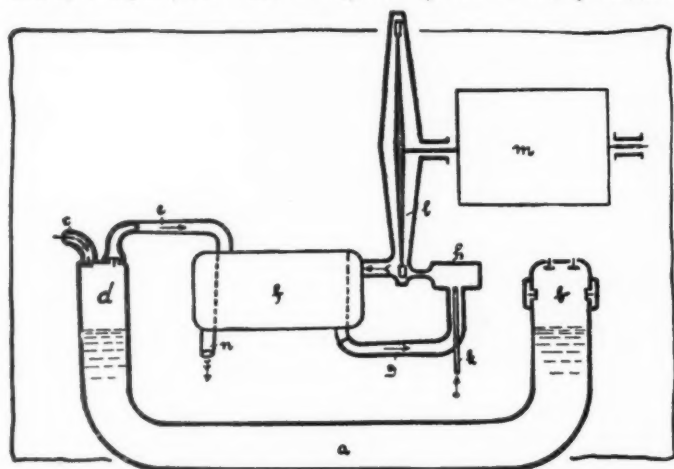


Fig. 2—An application of water-piston for compressing charge

it is not highly effective. It is to be assumed, however, that trials with this system are being continued, as the patents of the Armengand-Lemale concern show progressive improvements indicating practical work. Their first device worked on the lines shown in Fig. 4, where *a* is the combustion chamber, the gases from which expand in *h* and actuate the turbine *g*. A portion of the gases escapes to the injector which is formed of the nozzle *o* and the suction-and-pressure pipe *p*. The air arriving here is compressed and is forced through the pipe *rk* into chamber *a* as air for combustion. Before its entrance the fuel is sprayed into it through pipe *i*. In a later development an auxiliary chamber is arranged for taking the exhaust to the injector, and it also seems that the pressure created by the injector has been found insufficient; for in another patent, represented in Fig. 6, a turbine-compressor *s* has been added to reinforce the injector *oq*; the pipes *r*, *v* and *u* take the compressed air to chamber *a* from where it enters the usual expansion nozzle of the turbine *x*, which is mounted on shaft *y*; the intake of fresh air is at *t*.

The constructions referred to indicate to some extent the nature of the work done for the improvement of gas turbines of the isothermic combustion type since Holzwarth published the results of his experiments in 1911. The explosion gas turbines have had another development, as the compression problem is less urgent for them, while the cooling and regulation, on the other hand, are more difficult.

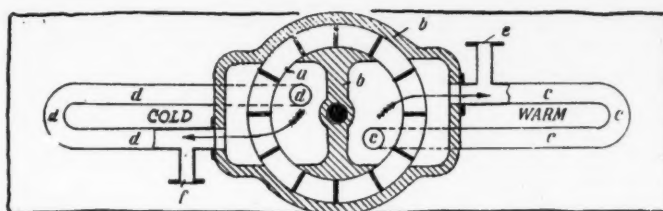


Fig. 3—Lehne's stepwise compression method

Questions of Materials for Turbines with Sidelights on Their Use for Automobiles and Motors

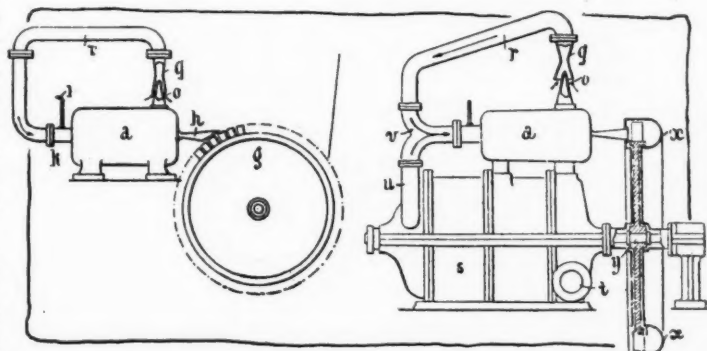
Cast iron is the material that suggests itself first for the combustion chambers and housings of turbines. According to tests by Howard and by Bach, cast iron loses in strength and elasticity at increase of temperature, but in much smaller degree than steel or bronze. While the strength of certain bronzes goes down to 18 per cent. of the original at a temperature of 500 degrees centigrade, that of cast iron does not drop below 76 per cent. at 500 degrees and 52 per cent. at 570 degrees.

Cast iron has been further improved in stability through alloys with silicon, magnesium and aluminum, and these alloys are now widely used in Diesel motors. Steel castings are perhaps strong enough at 500 degrees but have an expansion and contraction twice as great as the corresponding figures for cast iron, according to Martens & Heyn: *Handbuch der Materialkunde* (Manual of Data of Materials), 1912 edition, and is therefore not so liable to heat-cracks.

For the combustion chambers it would be advisable to line the cast iron walls with fireproof clay, magnesites or chrome composition. [The author mentions a number of German firms supplying these materials.]

One of the most troublesome questions relates to the materials for the turbine wheels and vanes. These parts must be very strong to resist the very high centrifugal forces and should be as indifferent to changes of temperatures as possible in order to obviate internal stresses; above all they should be able to withstand the influence of temperatures as high as 600 to 700 degrees centigrade as well as that of the gases used in the turbine. They must finally be made of materials which can be worked into the required shapes economically. In steam turbines the 25 per cent. nickel steels selected by reason of their small expansion have not given as good results as 5 per cent. nickel steels, but it is feared that the latter will not be able to withstand the disintegrating effects of temperatures above 500 degrees centigrade. Nickel steel of 33 to 36 per cent. ("ainvar") and a number of chrome-nickel and nickel-tungsten-vanadium steels made at various German works offer theoretical guarantees which should be tried out.

Alloys of kobalt are probably more promising than any other since the rich finds of kobalt in Canada and in the Belgian Kongo state, coupled with the new working processes of Borchers Brothers of Goslar, have caused the prices for this



Figs. 4 and 5—Successive stages of Armengand-Lemale turbine with compression by injector first and injector plus rotary pump afterwards

material to be much reduced. A combination of 75 per cent. of Robalt with 25 per cent. of chromium has been patented as a material for turbine vanes by Professor Tamman of Göttingen.

It has also been shown that the resistance of cobalt alloys with copper and tin against the effects of sulphuretted hydrogen and sulphuretted acids, which occur at the combustion of many crude oils, especially those from California and Mexico, is greater than in the case of any other metal which could be considered.—From *Der Motorwagen*, November 30.

The Complications of Electric Lighting

COMPLICATIONS in the construction of automobiles have made them reliable and easy to manage. A complication once mastered by the builder becomes a convenience for the user. The old combination of a storage battery, a coil with vibrator and a spark plug gave the user much to do to make sure of ignition, while the magneto, much more complicated as a mechanical piece of construction, goes on operating without attention, yet it was looked upon as a complication at first. With regard to electric lighting of automobiles the same distinction between complications for the builder and complications for the user is worth keeping in mind. Five kerosene lamps, with tanks to be filled and refilled, wicks to be trimmed, grease to be wiped off, reflectors to be kept from smoking up and tarnishing, and to be lighted, each separately, with a match—or a box of matches if it rains or blows—by a person stepping out, perhaps in the mud, and soiling his clothes by leaning over the car in five different places, constitute the most complicated lighting equipment for the car user, and the most uneconomical if the saving of time and bother which the car places within his reach is of any value to him. The ability to light up from the seat by pressing a button is probably the most precious advantage of the electric system, and is being adapted to the acetylene lighting system, too, but not without a complication which is to be mastered. You light the headlights while driving, you turn them off to pass through a big town where their glare might be useless or dangerous, you turn them off for scared horses, and then you light them again. The light is at the ends of your fingers. There is no flame; hence the light can be placed where you want it, inside and outside, in front of oil sights and speed indicator, in the midst of the motor mechanism if something requires inspection.

Until the tungsten filament was invented, electric lamps consumed 2 to 3 watts per candlepower and did not endure shaking very well; an equipment providing 100 candlepowers thus consumed almost 1 horsepower. The tungsten lamp consumes only one-half as much. Why not light by means of a dry or storage battery? It would be simpler. Yes, in equipment but much more complicated in maintenance. The dry battery requires renewal of its elements, or replacement, and the current it furnishes is expensive. Supposing a battery were required to supply 100 candlepowers for 5 hours. With tungsten lamps, 150 watts per hour would have to be the output; in all 750 watt-hours. It is usually figured that the best dry bichromate battery furnishes 1,000 watt-hours at a price of 4 francs (80 cents). The lighting of a car for 5 hours from a dry battery would thus cost 3 francs (60 cents). The same amount of current from an electro-magnetic generator, figuring with a generator efficiency of only 50 per cent. and a price for gasoline as high as 50 centimes per liter, costs only one-fifth as much; drawing, as it does, upon the vehicle motor for not to exceed one-fourth of a horsepower, which corresponds to a consumption of about 150 grams of gasoline per hour.

By storage battery? Without any generator on board to keep it charged! This is the supposition for avoiding "complication." It must be recharged frequently, since we have use for 150 watts per hour, say for 5 hours; 750 watts in all. And a storage battery with a capacity of 750 watt-hours weighs about 50 kilograms (110 pounds), which should be enough to

carry, and takes up a space of about 40 cubic decimeters (about 1 1-2 cubic feet). The matter of getting the battery conveniently, properly, frequently and cheaply recharged is therefore very important; and, in practice, no possibility exists for getting it done satisfactorily except by carrying the charging equipment in the car in the form of a generator. For the purpose of having the current furnished by it constant, so that no bothersome question may arise as to whether sufficient current is on hand, it is also necessary that the battery should be kept up to a full charge continuously, and the very consideration of lighting direct from a storage battery is either not used at all or is reduced to a small convenient size, sufficient, since it is always kept charged, for keeping the lamps going when the motor of the car is not running.—From *Omnia*, December 6.

Reduction of Chassis and Vehicle Weight

THE comparative heaviness of European chassis has become almost a by-word in these days of Transatlantic activity, according to Robert H. Giblett, a British automobile engineer, and there is, no doubt, much room for improvement in the direction of chassis lightening, he admits. It is evident that it must not be accomplished by cheeseparating methods; also, that the methods by which lightness is arrived at in racing car chassis are too costly for introduction in everyday construction. The independent coachbuilder of Europe has much to do with the trouble, as he may load down a chassis unduly, against which contingency the chassis builder must take precautions.

If a frame member is designed mathematically for the lightest possible form, it may happen that the convenient attachment of a change-speed bracket may lose it much of its mathematical virtue. Mathematics should therefore be employed after a design has assumed definite form on paper. Many savings can then be effected by paring here and there, as simple arithmetical judgment may dictate. Tubular construction of shafts, while obvious, is usually impossible economically and with reference to the diameters of ball bearings.

Stampings and castings offer the best opportunity for reductions. It has been said that any part made after a paper design can be reduced or improved by redesign. Wooden models would often permit the paring to take place before dies have been sunk.

Uniformity of stresses makes for reliability. Therefore the stouter of two components of a mechanical part can sometimes be reduced with an all-around gain in strength.

The buying of castings by weight may have a tendency in the wrong direction. Castings should be met at the factory with a pair of scales in one hand and a micrometer in the other.—From *Internal Combustion Engineering*, November 26.

Preventing Tire Trouble

An hour in the garage saves three on the road. An evening spent on the tires while the car is in the garage will save many dollars during the season and will save many an unpleasant experience on the road. The first work to be done is the permanent repairing of the tubes which have been punctured or hastily patched. Slow leaks should also be looked after and cured. This is the tube work. On the shoes the filling of cuts and tears and the curing of bruises will be the cases to diagnose and heal.

In storing tires for the winter remove them from the car, wrap them in strips of thick brown paper which can be wound on in a spiral in the manner similar to that in which new tires come. Before taking them from the car wash them thoroughly with soap and warm water being sure that they are dry before wrapping them up. Put the tires in a cool, dark place.

The Grossman Plant

**Has Floor Space of 30,400 Square Feet—
Spark-Plugs Chief Product—2,000,000
Turned Out Annually**

THE New York and Detroit factories of the Emil Grossman Mfg. Co., were merged in Model Factory 20, on September 15, 1913, Bush Terminal, Brooklyn, N. Y., occupying 30,400 square feet which is two and one-half times the total floor space formerly occupied in New York and Detroit.

To give an idea of the immensity of the equipment, it took 150 mechanics nearly 2 months to install the different departments in the factory and build stock bins and office partitions. The moving of the machinery and stock from New York and Detroit was accomplished over Labor Day, without serious interruption to shipping, stock having been prepared in advance. Eighty 5-ton trucks were pressed into service in transferring the New York factory and four 80,000 pound box cars were required to move the Detroit factory.

The machinery and routine of work are so planned as to insure the maximum of efficiency.

Spark-Plugs Are Chief Product

Red Head spark-plugs, of which over 2,000,000 are sold annually, being the chief product, a large part of the manufacturing floor space is given over to the drill presses, cementing ovens, lathes and specially designed assembling machines. The majority of spark-plug manufacturers buy the porcelain and mica insulators complete. In April, 1913, the potteries of A. C. Grainger & Sons Co., at Trenton, N. J., were purchased, the original owners continuing to superintend the operation for the company. The porcelain factory which consisted of one frame building and one 12-foot kiln at the time of purchase, was immediately enlarged. Three new buildings, one 15-foot firing kiln and one 9 by 9-foot decorating kiln were recently completed. The capacity of the potteries is over 5,000,000 porcelains annually.

Mica insulators are manufactured from amber mica washers and sheets. Numerous lathes, grinding machines, and compression apparatus with a capacity of 3,000 pounds to the square inch, are used to work the mica washers of tissue paper thickness into integral masses capable of resisting the deteriorating effects of oils and gasoline when performing their function as insulators.

For the manufacture of hookbolt bumpers, tire holders, license brackets, oil gauges, pedals, terminals and a complete line of Ford necessities, which constitute the miscellaneous products of the company, the equipment includes, besides sundry machinery, a 35 by 36 foot buffing room with eight buffers, four grinders and a large Norton water-wheel grinder and a Sterling blower system, a 24 by 35-foot plating room with three 72 by 36 by 36-foot nickel, brass and copper plating tanks and a 24 by 36-foot enameling room with two 6 by 6 by 8-foot ovens, dipping tanks and racks.

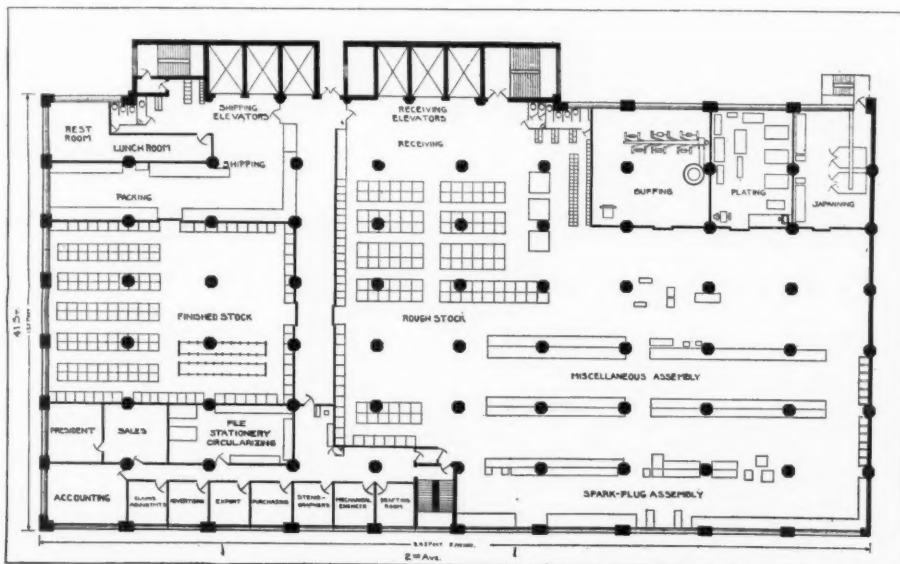
Realizing that economical manufacture means feeding the machines with good material in big quantities, the raw material stock room was given ample space for present requirements and to permit of expansion. This department



Interior view of new Grossman factory before occupancy

has 620 stock bins, numbered to correspond with a perpetual inventory card in the superintendent's office, which shows the minimum and maximum quantity that should always be in stock and the quantity on requisition in the purchasing department. All incoming material must pass inspection and be checked up with blue prints before it can be placed in stock. Material is supplied only on orders signed by the factory superintendent or authorized foreman. Three 5,000 pound elevators are utilized in discharging incoming freight direct from the freight cars into the receiving room.

The finished stock room measures 52 by 72 feet and in point of square feet is second only to the manufacturing department. Five hundred and fifty-six stock bins and four bumper bar racks, 26 by 44 by 7 feet have thus far been completed, with a great open space available for future use. Each bin has a number that corresponds to a perpetual inventory card which designates a minimum and maximum quantity for each season of the year, below which the stock must not be permitted to fall, and the length of time required to manufacture the item in prescribed quantities. Goods are invariably manufactured for stock and not for any particular order. Goods on customers' orders must be picked out on the day received or the following day at the latest. If it is impossible to complete any order, notice on a form provided for the purpose is sent to the sales manager who decides whether to hold up shipment pending the completion of the order or to back order. This system renders it almost impossible for an order to remain in the stockroom without receiving attention.



Floor plan of the new plant of the Emil Grossman Mfg. Co., Bush Terminal, Brooklyn, N. Y.

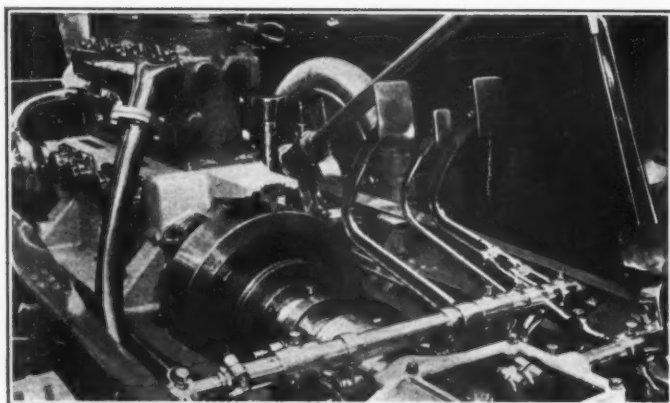


Fig. 1—Argyll sleeve valve motor seen at the Olympia show in London. A novel feature of this motor, which will be apparent from the illustration, is the mounting of the dynamo platform above the flywheel

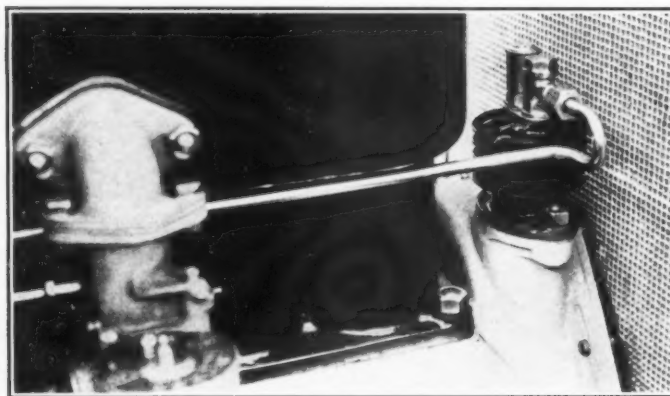


Fig. 2—The S.C.A.T. motor for 1914 has an interesting departure in construction in that it has an air pump for the self-starter mounted on the timing gear case just behind the radiator

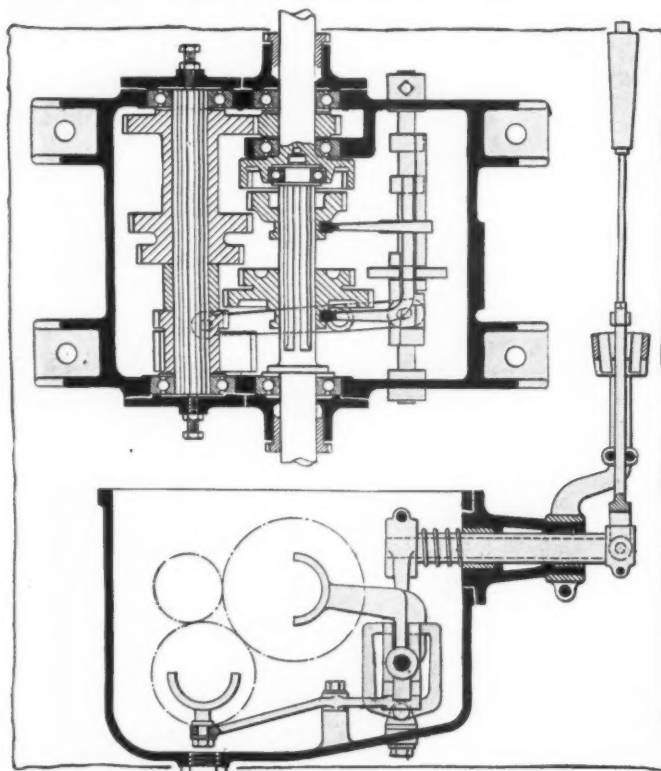


Fig. 3—An ingenious gearshift is the product of E. J. Wrigley & Co. This will be exhibited at Olympia and comprises a guide bar of circular section fitted inside the gearbox and carrying slides, each of which can be actuated independently of the other

New Things in Foreign Design

Air-Pump for Starter—Novel Gearshift—Segmental Clutch—New Method of Assembling Bearings

AT the recent Olympia show held in London many interesting departures in construction and novel changes in design were to be noted. Among these were the Argyll sleeve motor having the dynamo platform situated above the flywheel; the air pump for the self-starter fitted to the S. C. A. T. motor; the ingenious gearshift design by Wrigley; the new method of assembling annular ball bearings by the Hoffman Mfg. Co., and the system used by the Napier in lubricating its universal joint. These features are illustrated herewith, the more important described in a brief manner. Several other interesting developments in foreign automobile design and construction are also discussed. To render the presentation of the various subjects intelligible, each has been placed under a separate heading.

Wrigley Gearshift Design

An ingenious gear change mechanism has been brought out by E. J. Wrigley & Co., in which a guide-bar of circular section is fitted inside the gearbox and on this bar are mounted slides, each of which can be actuated independently of the other. Three slides are shown in the drawing, two being for speed variations and one for reverse.

The slides are provided with a fork-lever for engaging the gears in the usual manner. The hand-operating lever is accommodated with an extension below its pivot which can be made to engage either of the slides selectively by its being mounted on a laterally movable shaft.

A gear quadrant of usual form is provided which prevents the lever from moving when any particular gear is in engagement. It will be seen that by this arrangement only one guide-bar is employed, consequently a gearbox of simple construction is obtained.

Segmental Clutch on Austin

The change in design of Austin is but slight. There are three principal models: 10, 20 and 30 horsepower. The 10 horsepower has a four-speed gearbox in lieu of the three speeds provided this year. Separate cylinders and the segmental cone clutch with Ferodo friction surface are retained. The clutch has the friction surface in six sections, each section rivetted to a steel plate. With this method of construction spare sections can be carried conveniently. The coned surface of the clutch has a considerably steeper angle than is usual and this is so seemingly on account of the material used as the frictional element. The arrangement of clutch disengaging levers shown is a good one and renders the clutch light to the foot; there is an adjusting screw to set the pedal at the most convenient angle for the driver. The gearbox is provided with a deep channel at the bottom forming a sump for collecting dirt and foreign matter; this channel is sloped towards the rear where a drain plug is provided. The front end of the box has a casting supporting the outer ball bearing of the driving shaft and at the same time forming a cover for the front layshaft bearing; while at the rear a single casting forms a cover over both shaft ends, the layshaft and the driven shaft. There is a good large door for examination of the gears and a breather which also serves as an oil filler. In recent years these breathing pipes have become quite a necessary adjunct to the gearbox.

The manner in which large bearings have been introduced into the axle design without adding excessively to the bulk is a noticeable feature. A bevel differential gear is used and the wheels are cut solid upon the shafts. Single ball-journal bearings are used for the hubs. Excellent provision is made for preventing grease from finding its way into the brake drums; there is in the first case a felt packing round the supporting tube of the axle; should oil pass this packing it finds its way into a tubular extension of the wheel hub and is subsequently thrown off by centrifugal force into an annular groove cast in the dust guard of the brake drum. Hence it can flow by way of a large duct on to the road.

A flywheel guard, in the shape of an arch, bridges the flywheel, and is bolted at each side to the subframe. On the crown of this arch there is a table, to which the lighting dynamo is bolted.

Assembling Hoffman Bearings

The Hoffman Mfg. Co. is using a new method of assembling its annular ball bearings. In order to force the two concentric rings of the bearing into position a small wedging piece P is fitted at one side of the outer ring and the balls and inner ring are assembled as in Fig. 4. The outer ring is gripped firmly in a chuck K and rotated at a high speed. At the same time pressure is applied to the head H containing the inner ring and the balls are caused to travel up the wedging piece P so that they can slip into their proper places in the races.

The company has devoted considerable time and work to the task of devising the most accurate and efficient method of doing this assembly work. Experiments with various methods have resulted in the adoption of the one described as most satisfactory.

Oiling Napier Universal

Napier has a new design for the lubrication of the universal joint as well as for the telescoping action which takes place in such joints. Describing the invention broadly, when two shafts are subjected to any relative endwise movement, a hollow cylinder is formed or secured on one of them and a plunger on the other, to work in the cylinder, and to act as a pump. In the construction illustrated in Fig. 6, the shaft S is driven by the engine. The drive is transmitted to a hollow shaft S₁, which is fitted one of the elements of the universal joint; the drive is effected by a castellated head H on the end of the shaft engaging the interior of the hollow shaft. The pump cylinder is arranged inside the hollow shaft towards the left end, and it communicates by means of suitable ducts D with the bearings of the pins of the universal joint. The delivery valve on the pump is formed of a light steel spring, fitting closely round its left-hand end, which closes the ports in that end on the suction stroke, and opens them on the delivery stroke. The plunger P of the pump is formed as an extension of the solid shaft which is driven from the engine.

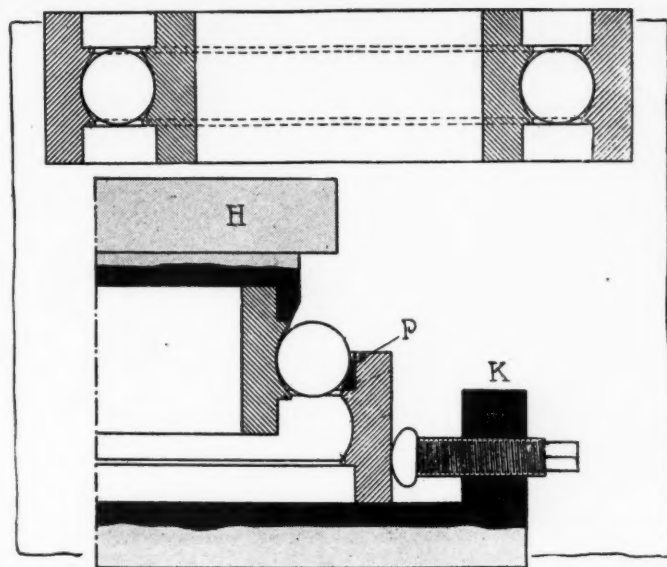


Fig. 4—Illustrating the new method used by the Hoffman Mfg. Co. in assembling its annular ball bearings. To force the two concentric rings into position, the wedge P is fitted at one side of the outer ring. The outer ring is gripped in chuck K and revolved at high speed. Pressure applied at the head H force the balls into high speed. At the same time pressure is applied to the head H containing the inner ring and the balls are forced to travel up the wedging piece P so that they can slip into their proper places in the races. The Hoffman company has found this method of assembling its bearings very efficient and generally satisfactory.

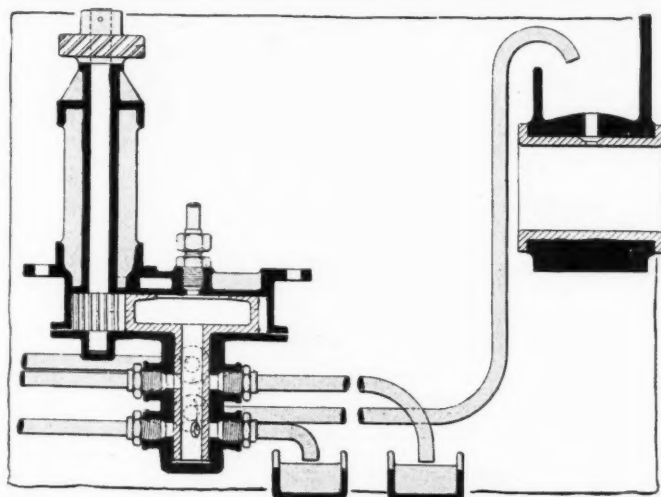


Fig. 5—Combined oil and distributing valve used by the Wolseley Tool and Motor Car Co. in its lubricating system. This is located in the crankcase and acts as shown.

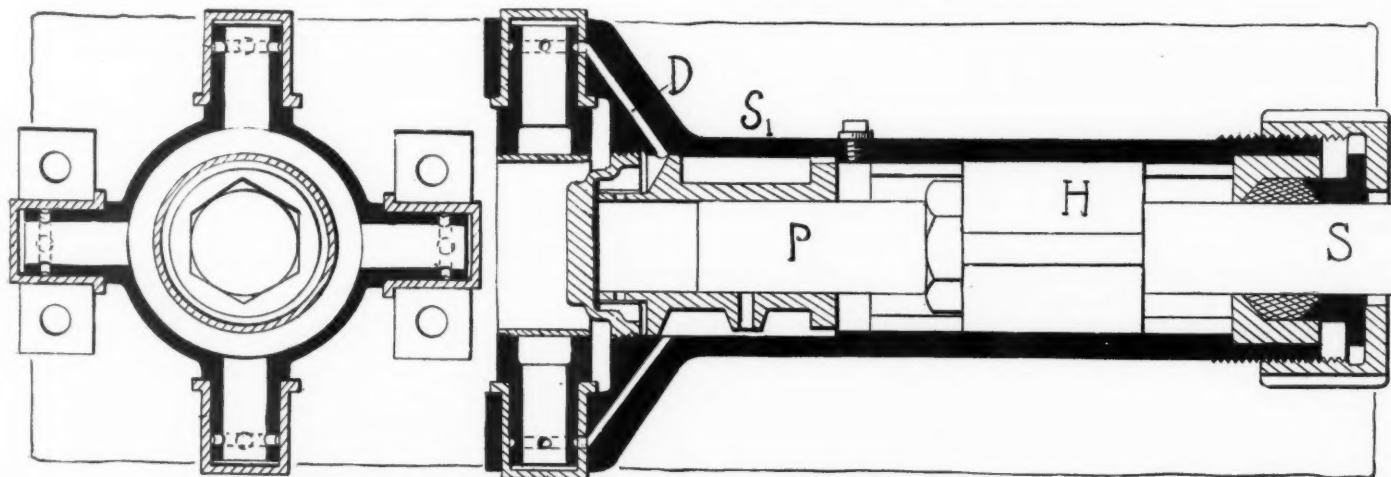


Fig. 6—New design for the lubrication of the universal joint brought out by D. Napier & Son, Ltd.

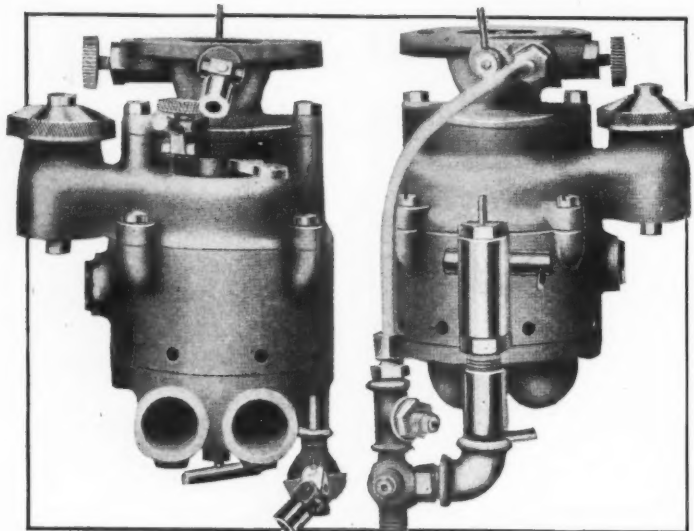


Fig. 1—Front and rear views of Knox carbureter, showing exhaust passageways at left. The gasoline connection is above and the kerosene connection below the two-way cock which controls the flow to the float chamber. A branch line from the gasoline pipe leads up to the flushing valve located in the intake

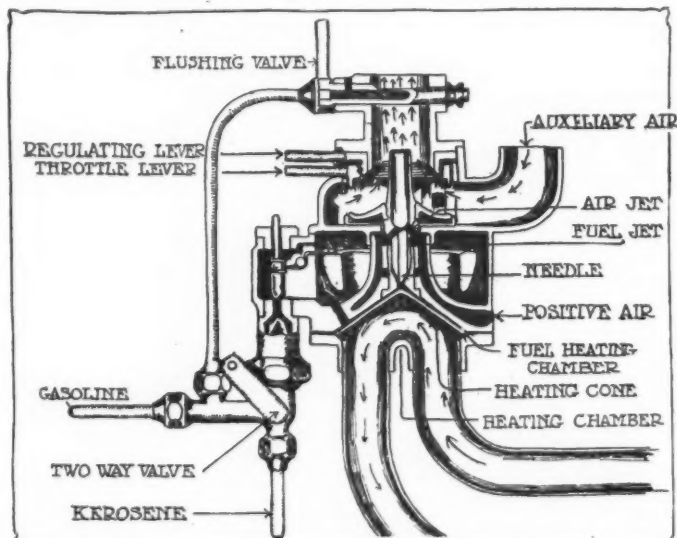


Fig. 2—Sectional view of carbureter, showing exhaust by-pass and thin conical heating chamber connecting the float chamber with the spray nozzle. Flushing valve is shown at the entrance to the intake manifold. This valve supplies gasoline for running the engine until it gets warm enough to operate on kerosene

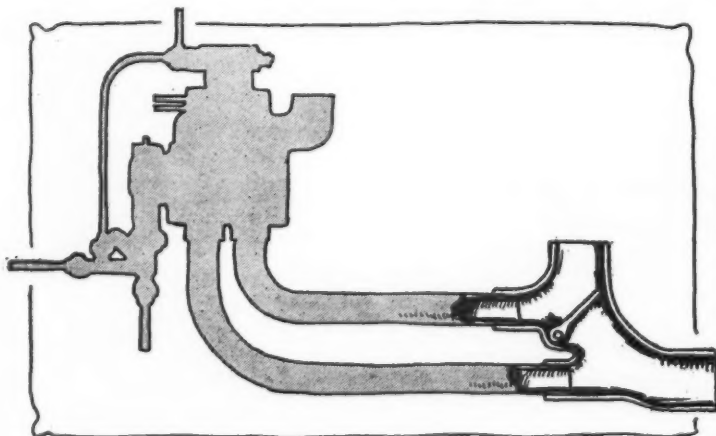


Fig. 3—Diagrammatic layout of exhaust connection for heating fuel. In the position shown the valve is directing the exhaust gases through the carbureter. The valve is controlled from the dash

A Carbureter for Kerosene

Maker of Knox Marine Motor, Anchor-Rockland Machine Co., Adapts Carbureter Used on Boats to Cars

Features Are Thin Heating Chamber for Kerosene and Method of Mixing Fuel With Air

A NEW kerosene carbureter is about to be placed on the market by the maker of the Knox marine motor, the Anchor-Rockland Machine Co., Camden, Maine. This carbureter, which is known as model E, is simply a refinement of model D, which has been made for several years.

The features of this device are the methods of heating and vaporizing the fuel. The heating is done by passing the kerosene through a thin conical-shaped passageway, Fig. 2, which connects the float chamber with the needle valve. The lower wall of this passageway, which is made of sheet copper, is exposed to the heat of the exhaust gases. The gases are brought to the carbureter by a by-pass which is controlled by a damper, Fig. 3, operated from the dash. After the fuel is heated it passes by the needle valve, Fig. 2, which regulates its flow, and on up into the mixing chamber through a series of small nozzles. Air is led into the mixing chamber through tubes which register with the fuel nozzles. The small columns of air entering the mixing chamber at high speed strike the jets of fuel, atomizing them thoroughly.

Above this chamber is the auxiliary air inlet which adds sufficient air to the mixture to secure complete combustion of the fuel. The needle valve is attached to the throttle lever and raised by it to provide for the increased fuel demanded at higher motor speeds.

Same Adjustment for Both Fuels

It is claimed that this carbureter will run equally well on kerosene or gasoline without any change other than switching the two-way valve, controlled from the dash, from one position to the other. Starting is accomplished by running from 15 seconds to 3 minutes on gasoline, but to do this it is not necessary to empty the float chamber of kerosene, as a special gasoline feeding device is installed for starting, which supplies fuel directly to the intake manifold. A valve in the manifold, called a flushing valve, so regulates the flow of gasoline that a correct mixture is supplied to the motor at low speeds until it becomes warm enough to run on kerosene.

This carbureter may be had in 1, 1¼ and 1½-inch sizes.

A Piston Material Lighter Than Aluminum

A series of alloys that possess some very interesting properties are offered by the Garford Engineering Co., Elyria, O. The foremost of these is one that is lighter than aluminum, non-corrosive, capable of being threaded, non-tarnishable and yet has a tensile strength of 25,000 pounds per square inch. It is not attacked by vegetable or fatty acids and will withstand successfully the action of salt water. It can be rolled, forged, drawn die-cast and spun.

A slightly heavier alloy has a tensile strength of 30,000 pounds per square inch, but this one does not possess the remarkable properties of the lighter alloy.

Another of these alloys has shown a tensile strength of 67,000 pounds when rolled.

It is claimed that these materials can be used for pistons, connecting rods, bearings and other parts where extreme lightness is desired.

New Rayfield Is Out

Model A, When Water-Jacketed, and B, When Non-Jacketed, Designed for Present-Day Low-Grade Fuel

Built on Same Principle as Model D, But Has New Float Control and Other Features

THE Findeisen & Kropf Mfg. Co., Chicago, maker of Rayfield carbureters, has just announced an improved type which differs structurally from its predecessor, the model D, but remains unchanged in principle. The newcomer is known as the model A when water-jacketed and the model B when non-water-jacketed. The most important change made has been in the float mechanism, which has been redesigned, a new method of float control being adopted, the new model employing fulcrum lever arms directly above the float instead of a weight on the needle itself in a chamber beside the float. An efficient strainer trap has been incorporated and is so arranged that the strainer body may be turned at any angle.

Changes Made to Handle Low-Grade Fuel

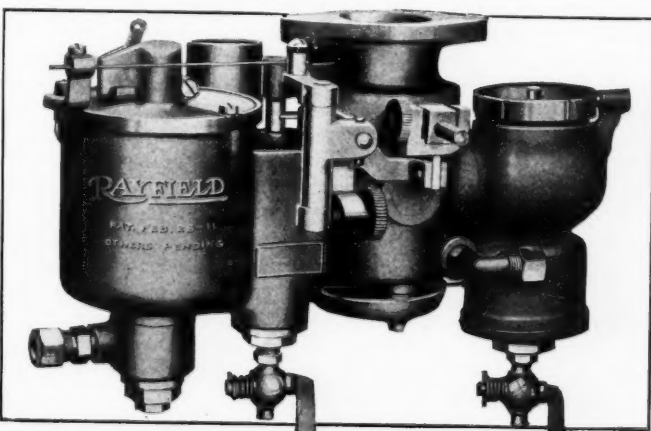
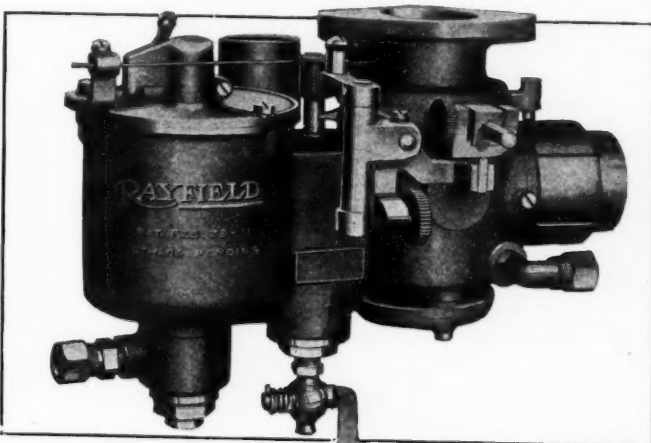
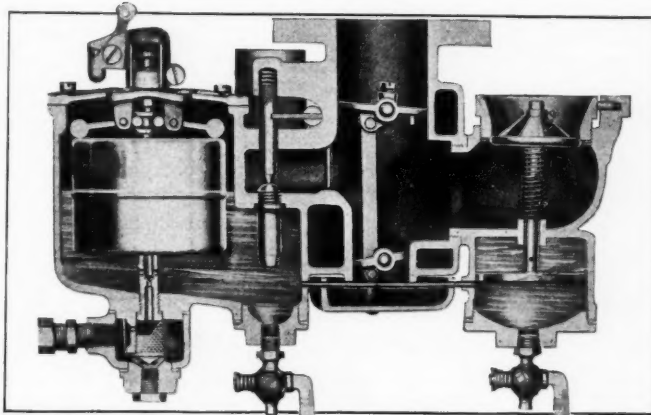
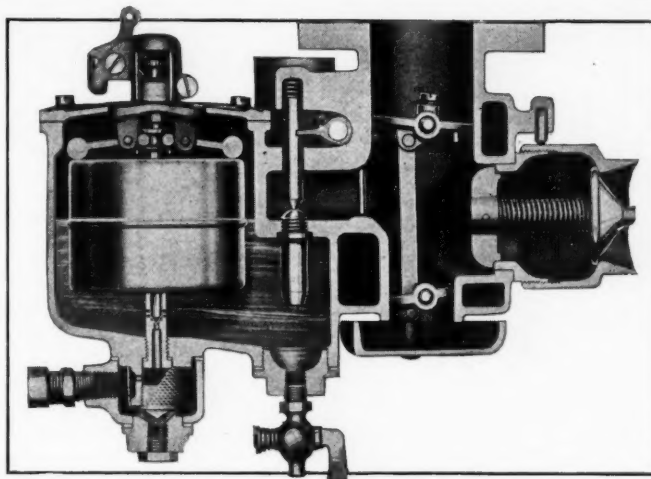
The changes in construction noted have been made to produce a carbureter which would be as efficient as possible for variable pressures, one which could accommodate the present poor-quality fuel and handle that fuel more economically than before, and according to the maker, the tests at the plant and on every conceivable type of motor, have shown that the designer, Charles Rayfield, has accomplished his purpose. Little refinements have been made also, the most important one being the marking of the fuel and air adjustments so that the novice will have little trouble in ascertaining which way to turn the screw.

As will be noted from the illustrations of the section of the new model A Rayfield shown, there are two fulcrum lever arms above the float, which control the needle valve, the stem of which runs through the brass float. As the float rises the arms are lifted and the farther they lift the more the fuel opening is closed. This change in float construction has necessitated the changing of the fuel inlet which is now directly below the float chamber. A large water and sediment pocket is thus provided. Draining is accomplished by a cock at this point.

The exclusive feature of Rayfield carbureters has been the three air-intake design, one the constant air which feeds at all times, the mechanical air which works in conjunction with the throttle and the automatic air which feeds when it is called upon by the motor.

Dashpot Type for Sixes

Another recent product of the Findeisen & Kropf plant is the dashpot Rayfield shown in the illustrations, and which is exactly the same as the one previously mentioned except for the air control. The dashpot is marketed in two forms, single and double jet. The air valve stem is integral with the piston chamber and is continually in a bath of gasoline. On this type a quick throttle opening results in a rich mixture being supplied temporarily. This affords a quick pickup with an economical running mixture, allowing the fuel adjustment to be made to suit running conditions. With a quick opening of the throttle the air valve is prevented from fluttering by the resistance offered by the gasoline bath. Six-cylinder requirements have called for the double-jet dashpot. This carbureter is similar to the single jet except for the installation of an injector jet which runs from the piston chamber to the mixing chamber and a quick air valve opening causes the piston to exert pressure against the bulk of gasoline, thus spraying additional fuel into the mixing chamber, yet giving a lean mixture for running.



Top—Model A water-jacketed improved carbureter. Upper middle—New dashpot type especially designed for sixes. Lower middle—Exterior of Model A. Bottom—Exterior of dashpot type

Chemical Action in Storage Batteries

Paste Must be Porous to Permit of Proper Operation— Advantages of Different Kinds

SANDY HOOK, CONN.—Editor THE AUTOMOBILE:—All storage battery cells of the pasted plate variety, the predominating type used in connection with the modern motor car, are manufactured with a number of parallel plates whose construction is in most cases a variation of a close meshed gridiron. This structure is a skeleton framework of lead and is only used to support the paste and convey the electric current in a manner similar to the nervous system of the body. It has no use in relation to the quantity of charge the battery will hold and is inert in the functioning of the battery from a storage viewpoint. The greater the subdivision of the crossing bars of lead and the more substantial this frame is made the heavier it becomes, but at the same time the little blocks of paste are each made smaller and their support is better. Later we will see the advantage of this, but it is not out of place to mention here that the above point makes clear the reason why a heavier battery, if other features are of equally efficient design, will stand a greater amount of service than a very light one.

Frames Filled with Lead Salts Paste

These frames are filled with a paste made of several of the lead salts such as red lead and litharge or other supersalts in the way of oxides and chlorides, depending on the individual maker and his process. Pastes made of certain lead salts on lead frames in a liquid composed of sulphuric acid and water change their character on the passage of the electric current and have a desire or inclination to get back to the original state before the charging current went through. This change is not possible, however, as long as the terminals are not connected through some electrical device or a short wire, with the exception of a small internal leakage. As soon as we take some current from the cell the change starts to permeate the paste, and for just so many amperes flowing for so many seconds, minutes, or hours, there is just so many ounces of paste has changed its chemical nature back to the original state. When all the paste has been converted no more current can be had from the battery until it has been charged by so many amperes for long enough time to re-convert the paste back to the artificial state again.

This action, both electrical and chemical, is slow in the description, but actually is as fast or faster than the average person can conceive. For instance; If you snap a wire across the terminals of a storage battery you get a spark and probably the wire was not in contact with the terminal more than 1/10,000 (one-tenthousandth) of a second yet from the time the wire touched until it separated perhaps a hundred or more amperes were flowing and a fraction of an ounce of paste on the plates had been completely changed and the process completed before the wire separated. This change is rather uniformly distributed throughout the whole volume of the plates, it will be understood, and is not a single spot in any one plate. The action, to form a clear conception, might be compared to a gradual mixing of black and white paint considering the white as a fully charged battery.

Now very great pains are taken to get the paste porous, as the plates must be like a sponge so that the acid can percolate throughout. This is because what is known as the sulphur radical or that part of the sulphuric acid carrying

the sulphur and other elements is taken from the fluid and absorbed by the paste during the change. This substance is absorbed from fluid on the change incident to discharging and is thrown out again on the change corresponding to charging. This is why the paste must be porous, as the weak and strong electrolyte must mix and even up both inside the paste and in the jar as fast as the paste is changing, or the battery will be sluggish and inefficient. The above action will make clear to the reader some of the ills of old batteries, most notably the filling up of the pores with foreign chemical substances so that there is no circulation and the rise of the specific gravity of the fluid when charging, owing to the addition of the sulphur element.

Gases Constantly Forming in Paste

The proposition therefore is to hold a mass of a rather granular character on a frame and convey the current to this mass through the frame so that it has to flow across as little paste as possible to get to all points and act upon them on charge or get the current to the frame on discharge. What is the greatest cause of trouble with realizing the permanent attachment of the paste to the grids is the evolution and disruptive action of gases constantly being formed in the substance of the paste and seeking liberation at the surface. These gases are always being formed but become violent on certain occasions. One is when the battery is charged to a point where all the paste has been changed to the artificial state and there is no more to be acted on by the charging current. The current must go somewhere, so it dissipates the water into hydrogen and oxygen gas which cause the liquid to apparently boil and practically blows all the paste off the plates in getting out to the surface. If on the other hand too great a charging or discharging current passes through the battery it will take all of the acid out of the liquid in the pores of the paste before new fluid can absorb or circulate into them and the surplus current will generate gas with the same effect on the durability of the paste structure. This is the cause of such heavy depreciation when the battery is used to furnish starting current for the motor and it is not possible to spread out the demand per square inch of plate by using more plates but thinner, to an extent possible within weight limitations and volume of the battery box. Not only this but the demands of the starting motor are so heavy that they cause the plates to buckle, warp, and otherwise break the joints between the paste and the lead frame to the detriment of letting the current act on the paste so separated. Further to keep within a decent weight and volume for the battery it must be kept fully charged or a few starts will kill it after it has been in use some time. This is directly in opposition to what is the only proper practice that has long obtained in stationary service where the cells are maintained just under 2.3 or 2.35 volts per cell at the most.

The condition at present existent with the starting battery and the necessity for such frequent renewals can be traced to a good many sources. The first is that the owner and manufacturer will not stand for the weight necessary to obtain a long life. The second is that the starter manufacturers want to make a showing by spinning the motor fast and let the battery shift for itself. The third is that the cost of a real battery designed for the work costs too much and the fourth

is that a lot of mushroom concerns rig up a melting pot and bowl of paste and knock the bottom out of the whole deal to the ultimate cost and annoyance of the owner. Very few people realize that the starting motor is only a machine of an electrical character whose design has been long worked out to an exact science in electrical engineering and that the proposition of electric starting will be made or broken by the battery and the efforts of those with the peculiar experience to successfully meet the new demand.

It is the structure of the battery that bears the strain and it does not seem possible to much lower the starting current as the mechanical work done in spinning the motor is represented by a very heavy current demand.

The writer feels that great activity will be seen in the battery field during the next year if the electric starter is to be permanent as the batteries now used are, from a conservative and sound viewpoint, about what most of the battery manufacturers would like to see for lighting systems alone.—C. S. COLE, Chief Engineer, Electrical Engineering and Storage Battery Co.

Tuning Fork Principle in Springs

CHICOPEE FALLS, MASS.—Editor THE AUTOMOBILE:—Our engineering staff discovered recently that, by applying the laws governing the action of a tuning fork to springs, they could oblige one portion of one set of members of their springs to neutralize the force of the other, and not only absorb the maximum possible amount of road hammering of the car, but also compel the two sets of springs to come to rest equally and quickly.

Thus, when the car goes over a bumpy road, the lower leaves of the springs have the same violent blow imparted to them that all other motor car springs receive, but instead of the upper leaves responding in sympathy with them at equal periodicity of vibration in the same direction, they respond at an equal periodicity of oscillations in exactly the opposite direction. The resultant effect is, therefore, zero theoretically, but the practical result is a comparatively few oscillations.—STEVENS-DURYEA CO.

Norwalk Eliminates Levers By Electric Brake Lock

MARTINSBURG, W. VA.—Editor THE AUTOMOBILE:—It was our idea that by the use of the Vulcan electric shift we could eliminate all the levers, providing a suitable and serviceable brake lock could be made, which would not require the tilting of the foot pad and thus accidentally lock the brake.

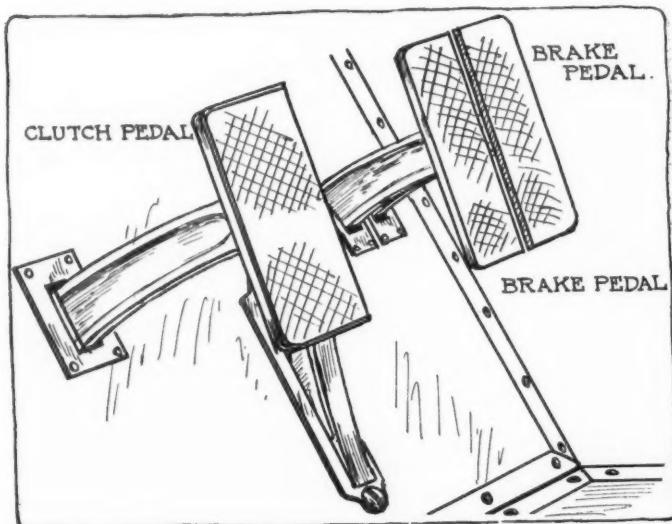


Fig. 1—Clutch and double-pad brake pedals on Norwalk

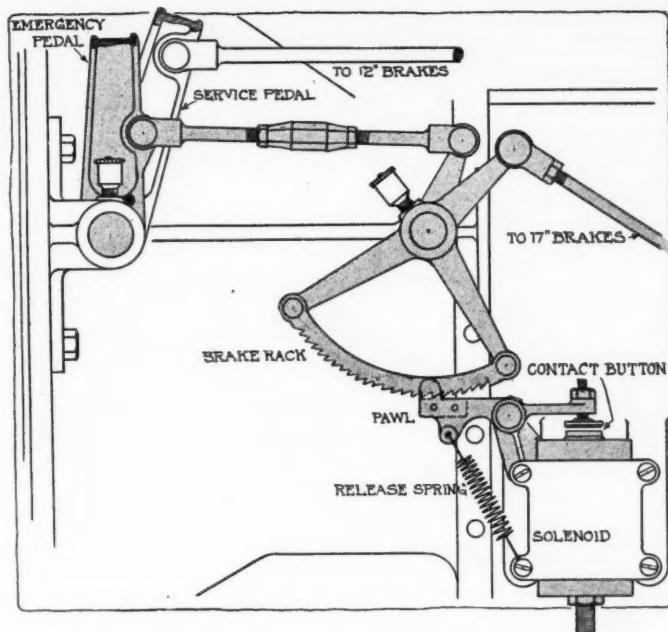


Fig. 2—Showing connection of emergency brake pedal through solenoid brake lock

For this reason we laid out the electric brake lock (Figs. 1 and 2) which allows the use of the two pads together or either one, as the case may be, and being connected up entirely separate to their own respective brake shoes, minimizes the chances for loss of car control through breakage of rod on either one.

A small button is placed on the casting under the steering wheel, which also carries the control buttons for the electric shift and signal, which, when depressed, sends the current through the solenoid fastened to the left side of the transmission case. This in turn draws the small lever and engages the pawl with the rack, requiring but $7/32$ inch movement to fully engage.

The pressure exerted by the brakes holds the latch in position, it only being necessary to energize the coil momentarily to pull the pawl. A light spring releases the pedal if farther depressed and then brake is again used as a service brake until such time as the pedal is locked down by pressing the brake button.

The advantages are many, it being necessary to sit in the driver's seat to reach the pad and thus disengage the brake, thus preventing any chance for releasing by small boys, etc., should the car be left on the street.

This construction has been tried out here in the mountains and even with the severe strains and jolts caused by going over the water-breaks the pawl has never released. This is mainly due to the fact that the line of suspension at the rear coincides with the axle and the fact that the springs are absolutely straight and thus all action of the rear axle is toward the rear on either upward or downward motion, and the fact that the brake equalizers, etc., are all carried on the torsion tube and thus keep the distance between them and the rear axle the same at all times.

A test car has been running for 5 months with this device and has in all probability gone 15,000 miles with never an instant's trouble. To date every car produced with this device has worked perfectly.

This elimination of the levers allows free ingress and egress from both sides to either seats and in no way makes the brake pedal more complicated, as it can be considered merely as an enlarged brake pad.

The rack is carried as shown by the sketch, Fig. 2, on a short shaft which in turn is mounted on a bracket on the case, which allows removal without disassembling brake pedal and shaft, this latter being connected to the rack by means of an adjustable rod and small lever.—W. S. REED, Norwalk Motor Car Co.

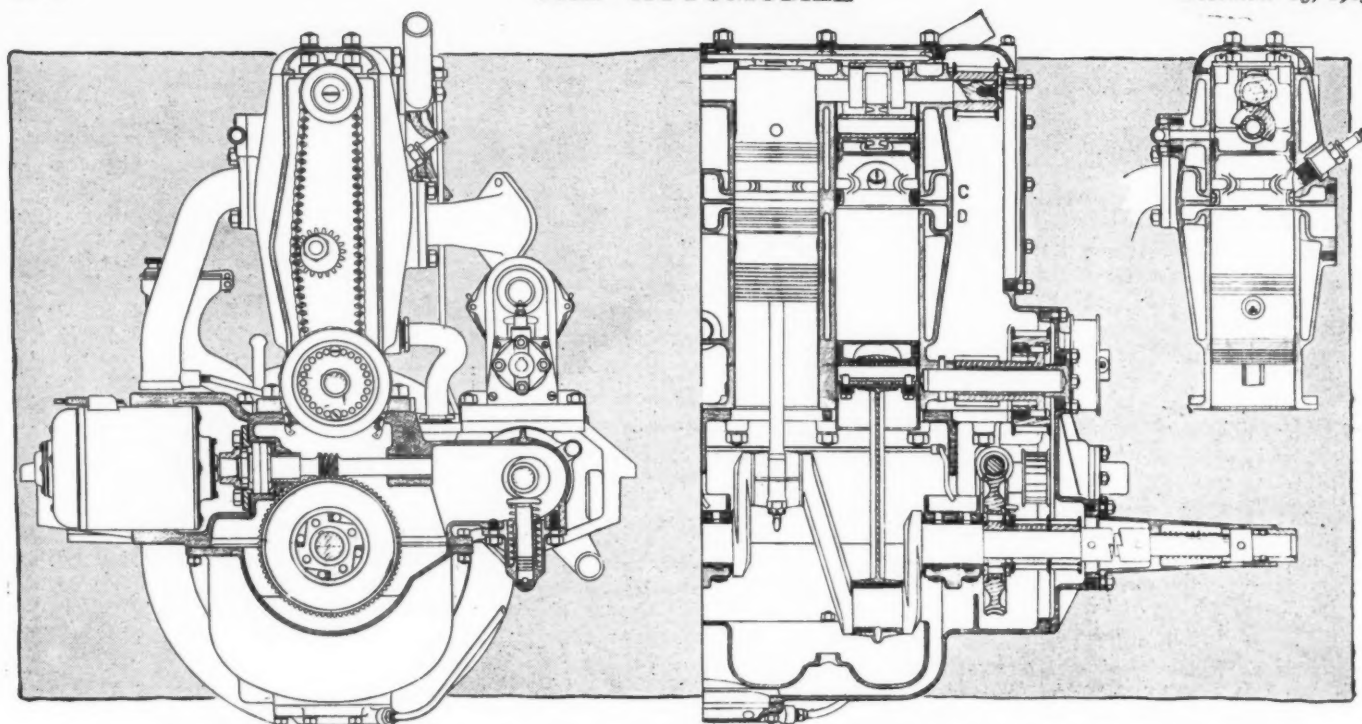


Fig. 1—End view and partial section of the Carter piston valve motor. The valves are operated by an overhead camshaft

Carter Motor Has Overhead Piston Valve

Short-Stroke Valve Controlled By Cam Operates In Cylinder Bore—Movement Partially Automatic

A NEW piston valve motor of interesting design is the Carter, which has been undergoing tests for the past 18 months and which is made by the Model Gas Engine Works, Peru, Ind.

The novelty of the design in comparison with existing types of slide valve is that no sleeves of any kind are used, the valve consisting of a piston similar and equal in diameter to the working piston and operating immediately above it in the same cylinder bore.

The cylinder casting has no head proper, but is bored straight through, Fig. 1, and the piston valve is fitted into the top of the bore, the lower edge coinciding with the circumferential valve ports C and D. Below this point the engine does not differ from any up-to-date and well-designed motor of the ordinary poppet valve type.

A diagrammatic view of the piston valve, Fig. 4, shows the essential features: At the bottom is an annular extension of the piston containing two expanding rings AA. These close the intake port C and the exhaust port D, Fig. 1. The upper or main portion of the piston is also fitted with rings and at the head carries on a pin G, similar to a wristpin, a roller H, which is arranged to be in continuous contact with a cam F on a camshaft K which passes over the tops of all the cylinders. This overhead camshaft is chain driven at the end of the motor, and the tops of both the piston valves and the cylinders are recessed to receive it. At each side of the center cam F above each cylinder is a cam E which bears on the underside of a bridge B bolted to the top of the piston. These cams are so designed that there is no vertical play, the outer duplicate cams E and the center one F bearing on the bridge and roller respectively at all times.

It will thus be seen that this piston has a travel determined by the shape of the cams that corresponds to the reciprocation

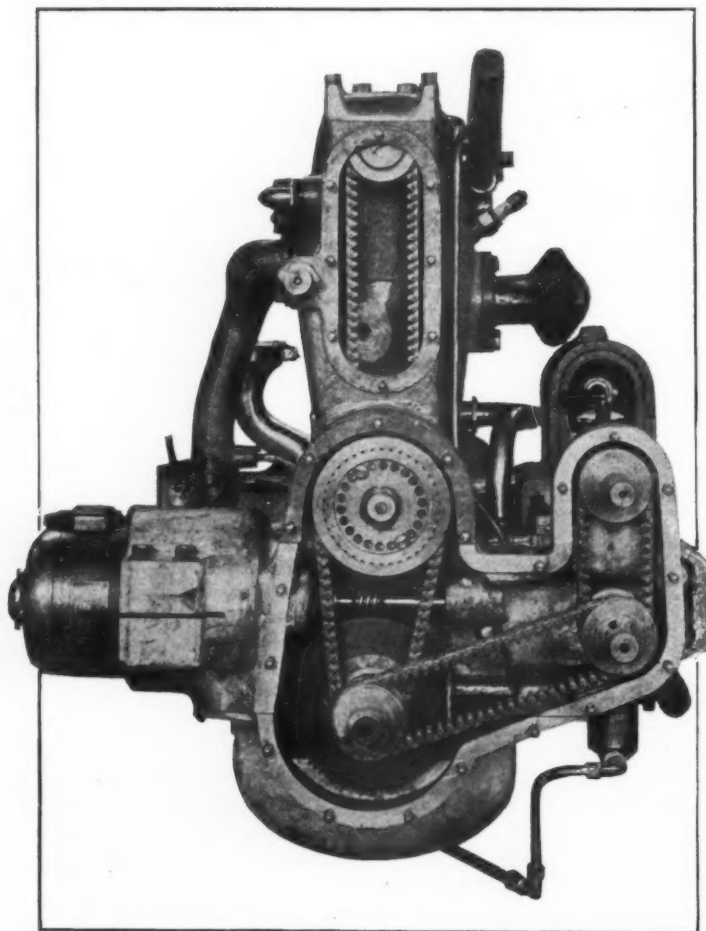


Fig. 2—Engine with endcover removed, showing the silent chain system of camshaft and magneto drive, as well as the application of the starting motor

of the poppet valve. The intake and exhaust ports C and D, Fig. 1, extend entirely around the cylinder wall with the exception of a small space for the split of the expansion rings, so that a large area is obtainable with a minimum necessary movement of the valve.

The operation of the valve will be realized by reference to the section, Fig. 1. In this the valve is shown occupying a position during its stroke when the exhaust port D is open. At the beginning of the suction stroke the cam F, Fig. 4, moves the piston valve down until the intake port C is open, which at the same time closes the exhaust port D.

At the end of the intake stroke, and at the beginning of the compression stroke, the upper piston moves upward .25 inch, or only half of the entire stroke, so that rings AA assume positions indicated by dotted lines, thus closing both intake and exhaust ports. The piston remains in this position during the compression and working strokes. Near the end of the working stroke, the upper piston again moves 1-4 inch upward until the exhaust port is fully opened again. This completes the cycle.

The movement of the upper piston at no time exceeds .25 inch, while the total range of movement in either direction is .5 inch, the complete movement taking place with two revolutions of the motor. In a motor with a 6-inch stroke, the working piston movement is exactly twenty-four times that of the upper piston.

Cams Act Only As Stops

On the suction stroke, the vacuum is sufficient to draw the upper piston after it to its desired position, the cam serving as a stop or timing of the movements. On the return of the compression stroke, the compression tends to lift the upper piston, the cams again serving as a stop and holding it in right position.

Near the end of the working stroke, the pressure on the upper piston is sufficient to not only raise it for opening the exhaust port without assistance of the cams, but exerts enough energy to materially relieve the camshaft driving mechanism. On a six-cylinder motor, this energy is sufficient to drive the camshaft so that the driving mechanism controls only.

At no time do valves open against pressure so that whatever wear there is on the cams is on the heel or part receding from the corresponding wearing surface.

One of the advantages of this design over the poppet type is that a quicker valve opening is possible. In order to obtain full opening of a poppet valve it is necessary that the flywheel move through a greater angle than is required by a motor with a short stroke piston valve of the type shown.

The particular engine illustrated is a four-cylinder one 3.75 by 5.75 inches bore and stroke. Its narrow design, due to the absence of the poppet valves and gear is noticeable in Fig. 2. The total height is 40 inches. The camshaft is driven by silent chain as shown in this illustration, from a countershaft also chain-driven from the crankshaft.

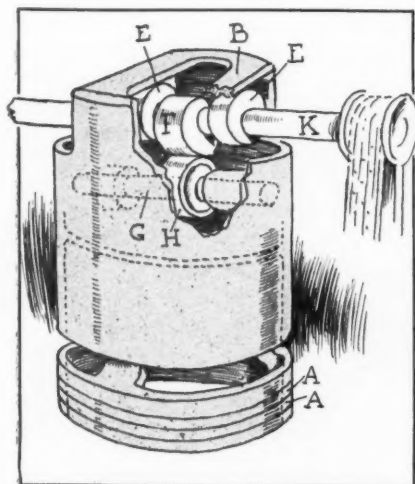


Fig. 4—Diagrammatic view of piston valve.

At the left side are arranged two shafts one above the other, the upper one carrying the magneto and the lower a lighting generator and pump. A transversely placed starting motor is also situated at this end of the engine, driving the crankshaft through a single worm reduction of 25 to 1.

The total weight of the new engine, without magneto, lighting generator, starting motor and carburetor is 554 pounds.

Some dimensions of the valves follow: The vertical depth of the intake and exhaust ports is 5-32 inch and they extend the full circumference of the cylinder except 7-8 inch. The total area of the valve opening is 1.75 square inches.

The valves are set so that the intake remains open 120 degrees after maximum opening and the exhaust 168 degrees after maximum opening. From the beginning to the full open position of the valve requires 62 degrees of flywheel rotation. In actual tests made the engine developed 41 horsepower at 1,700 revolutions per minute, 39 horsepower at 1,560 revolutions and 36 horsepower at a speed of 1,420.

Fig. 3 shows the clean exterior of the right side of the engine and the method of embedding the starting motor in the crankcase. In Fig. 5 a complete view of the power plant is shown. This includes the dropped frame of channel section to the transmission by which the three-point suspension principle is carried out. The lighting generator is shown in the center.

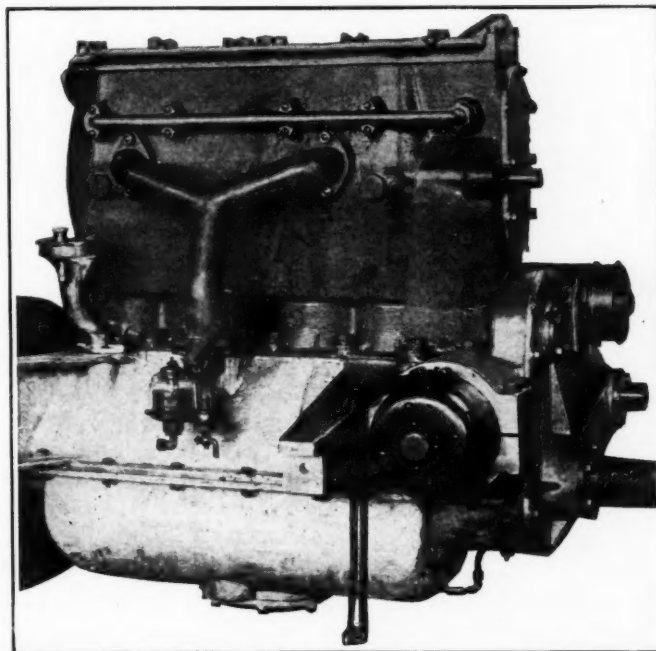


Fig. 3—Right side of Carter piston-valve engine

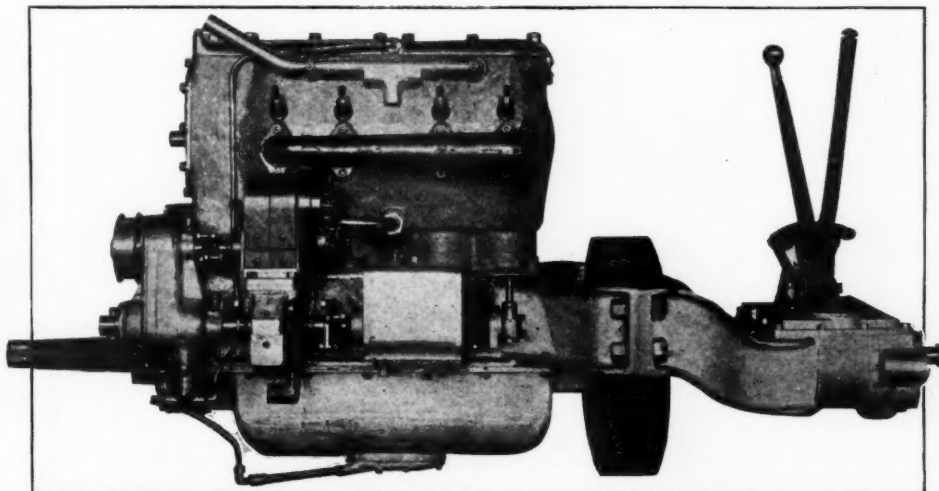
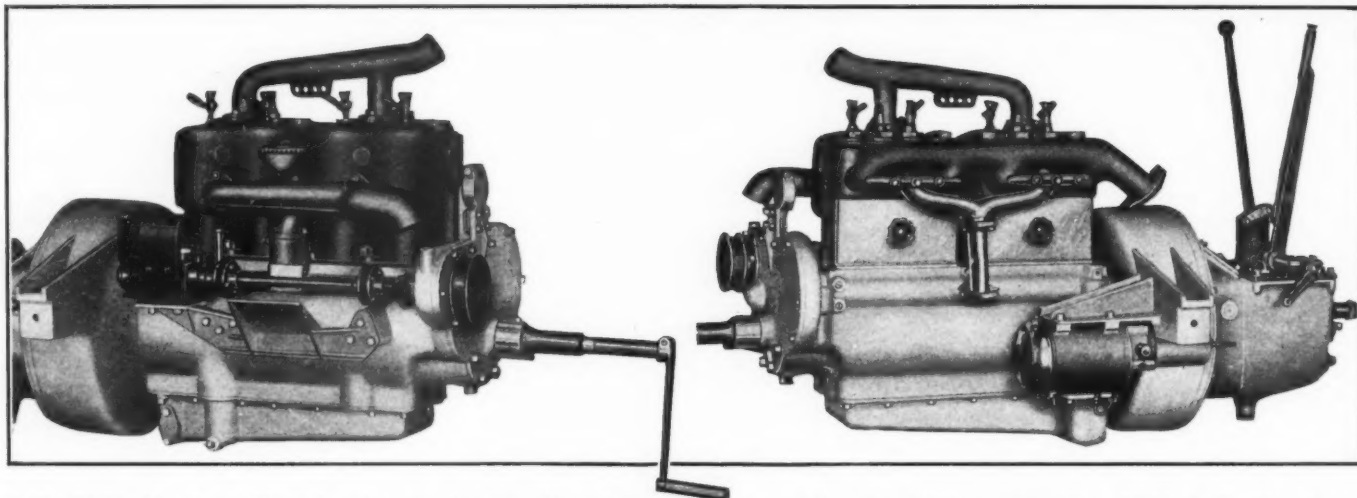


Fig. 5—Complete power plant and transmission including Carter piston valve motor



Left—Right side of new Hazard motor, showing mounting of magneto and provision for lighting generator. Right—Left side of new Hazard motor, showing starter mounting and position of control levers

Hazard Adds Two Four-Cylinder Types

Model C Has Bore of 3.75 Inches and Stroke of 4.5

Model CX Has 4-Inch Bore and 4.5-Inch Stroke

THE Hazard Motor Mfg. Co., Rochester, N. Y., has recently added two sizes to its Ergon line of four-cylinder motors, which are known as Models C and CX. They have a bore and stroke of 3.75 by 4.5 and 4 by 4.5 respectively. The makers designate these motors as 20-25, and 25-30 horsepower, while the S. A. E. rating is 22.5 and 25.6. Excepting a difference of .25-inch of bore the dimensions of two motors are the same. Little difference from previous models is seen, the greatest change being that the company has discontinued the manufacture of clutch and gearset, which, together with the motor, go to make up the unit type of power plant. The company now offers to fit its motors to a unit design comprising any make of cone or multiple-disk clutch and standard gearset.

Three-point suspension is used; that in front being a trunnion on the front cover-plate, which is also a bearing for the starting-crank shaft. In the rear, are provided projecting supporting arms cast integrally with the aluminum flywheel housing.

All types of motors have standard dimensions where standard dimensions have been established.

L-Type Cylinders

L-type twin-cylinder castings are used with the valves located on the right as in former models. The crankshaft is of the barrel type with the crankshaft center-line 4.5 inches from the bottom. Aluminum alloy of specified proportions is used. The bottom of the crankcase, which contains the oil reservoir, is made of cast iron for greater rigidity, and is

well fastened to the upper half by studs, nuts and lock washers.

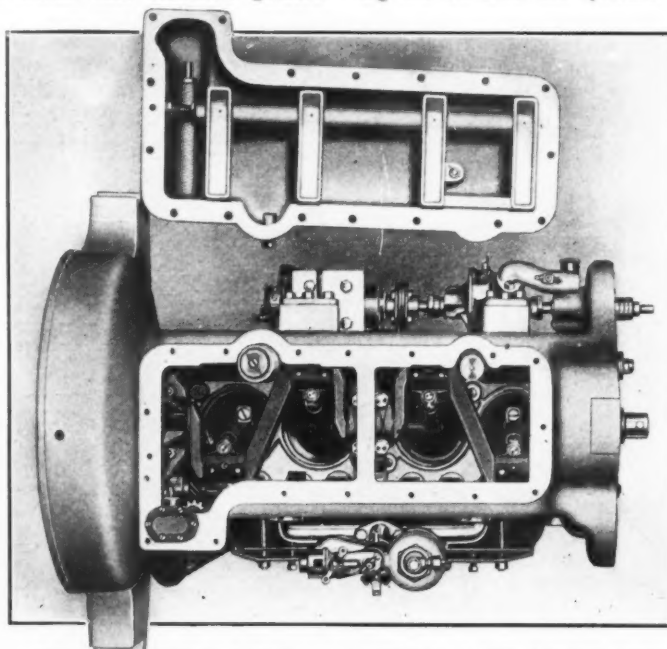
Two types of water manifolds are supplied: one for the thermosyphon system of cooling and one for the positive system in conjunction with a centrifugal pump. In the former case, inlet and outlet manifold diameters for hose connections are 2.25 inches, but for positive circulation these dimensions are only 1.25 inches. The waterjacket spaces are very large, tapering from 1 inch at the top to .375 inch at the bottom. Valve spaces are jacketed all around by liberal water space.

Oil is pumped from the reservoir in the bottom of the case through a fine mesh oil strainer into stationary troughs into which the scoops on the ends of the connecting-rods dip, splashing the oil onto the cylinder walls and into small wells which lead to the camshaft and main bearings and to the front gears.

The crankshaft is carried on three die cast babbitt bearings. These bearings measure, front 1.5 inches by 2.75 inches; the middle 1.5 by 2.5; rear 1.625 by 3.5 inches. The camshaft also has three bearings, the front one being made of hard phosphor bronze and the other two of die-cast babbitt. The two forward bearings are 1.875 inches in diameter and the lengths are 1.938 and 1.25 inches for the front and center respectively. The rear one is 1.188 by 1.375. These dimensions apply to both motors.

Valve Heads Cast Iron

Valves are composed of two materials; cast iron for the heads and carbon steel for the stems, the two being electrically welded. The valve diameter is 1.5 inches clear



Plan view through bottom of crankcase of new Hazard motor. Lower half, shown above, which contains the oil reservoir, is made of cast iron for greater rigidity. A three-bearing crankshaft is used

for model C and 1.625 inches for the CX type, while the lift in both models is .281 inch for the exhaust and .25 for the intake.

Front gears, of the helical type, are four in number, and are made from cast iron and steel. Front coverplates, which also furnish the bearing point for the front support of the motor, are made from semi-steel castings.

The cylinders are carefully finished by grinding and the pistons are balanced to the fraction of an ounce to secure minimum vibration at high speeds. The clearance between pistons and cylinders is .002 inches on the smaller motor and .0025 on the larger.

Crankshafts and connecting-rods are made of high-carbon steel. Connecting-rods measure from center to center 8.5 inches. The wristpin bearing in both models is 1 inch in diameter, while the lengths are 2.938 and 2.5 inches for models C and CX, respectively. The wristpin runs in cast iron bosses in the piston.

Both crankshafts and flywheels are tested for balance by running them on special machines.

Self-Starter Used

Arrangements have been made for driving several different types of electric self-starters by attaching a special flywheel housing with an opening near the bottom and to one side through which the drive-shaft of the generator passes. The drive is by means of silent chains and sprockets, one sprocket being attached to the shaft on the starting motor, and the other being located on the engine crankshaft in front of the flywheel. This method is particularly suited for single unit starters, and for such starters as the two-unit Gray & Davis and Disco where the generators are mounted above the starters. In the thermo-syphon model the two-unit system put out by the Deaco or Electric Auto-Lite Co. may be installed. In these two particular installations, the starter is mounted on a bracket attached to the flywheel housing and starts the engine by means of a gear which meshes with a gear cut in the rim of the flywheel. The generators made by these two concerns are double ended and are mounted on the right hand side of the motor in a line with the countershaft and the magneto, the magneto being driven through the generator, as illustrated. One of the accompanying illustrations shows the installation of the Deaco starter on the left side of the power plant, while another shows the magneto mounted on a special bracket with a dummy shaft with a flexible coupling at each end in the place of the Deaco generator. The generator is attached to the pad on the bracket which is at an angle.

Magneto and pump installations, as in 1913, are on the right side of the motor, these units being driven by a countershaft, a shaft and gear train which meshes with a pinion on the crankshaft.

The overall length of the motors, less the starting handle, is 59 inches, the height 29 inches, and the width 25.25 over the supporting arms. The frame widths suitable for mounting these motors are: for subframe, 17.75 inches and 24 to 27 inches for mainframe. The weight of the unit power plant complete is 500 pounds, while the motor only, with aluminum flywheel hous-

ing and flywheel, weighs 380 pounds. The subframe type with flywheel, but with cast steel support brackets in the place of flywheel housing, weighs 400 pounds.

A very thorough and efficient inspection department is maintained at the factory and all machined parts are inspected at the completion of each operation. Assemblies are carefully watched and complete motors are inspected during test and afterward, to detect possible imperfections.

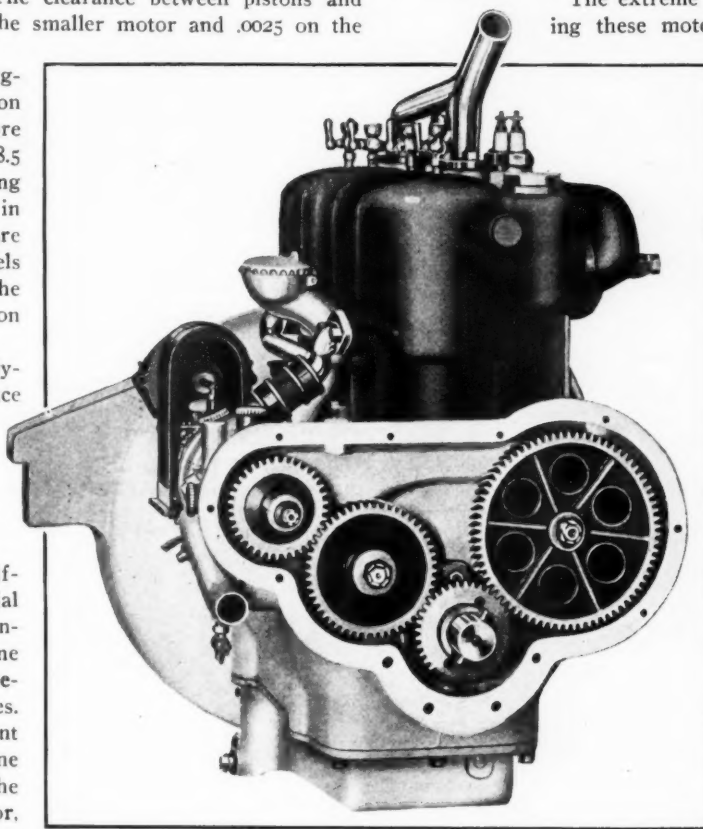
The extreme care that is taken in manufacturing these motors coupled with the careful attention that is given to their design has resulted in a very reliable and quiet running product.

Silence of operation is due not to the inclosed valves operated by cams whose surfaces are shaped to minimize the shock of opening and closure, nor to the helical gears, alone, but the specially constructed couplings that will not wear noisy, the silent chain generator drive, and to the fact that the starter pinion is fully inclosed in the flywheel housing, so that even its slight hum is muffled to a great degree.

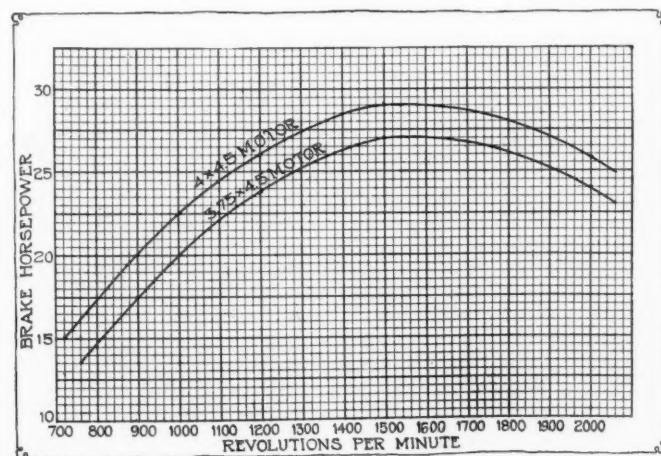
Good Output Curve

For those who are more technically inclined than the average reader, a study of the horsepower curves at the bottom of the page is of interest. These show that maximum output for both motors occurs at approximately 1,550 revolutions per minute, the 4-inch motor developing 29 horsepower at this speed and the 3.75-inch motor, 27 horsepower. Maximum speed of

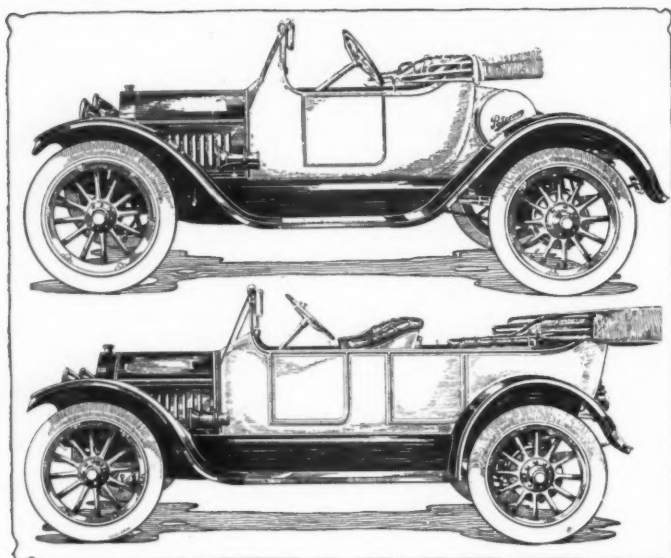
these motors is well above 2,000 revolutions at which the outputs are 26 and 24 horsepower respectively. It will be noticed that .25 inch difference in bore in two motors that are otherwise identical makes a difference of between 2 and 2.5 horsepower, the difference decreasing with increase of speed.



Three-quarter front view of new Hazard motor, showing arrangement of timing gears and neat design of cylinders

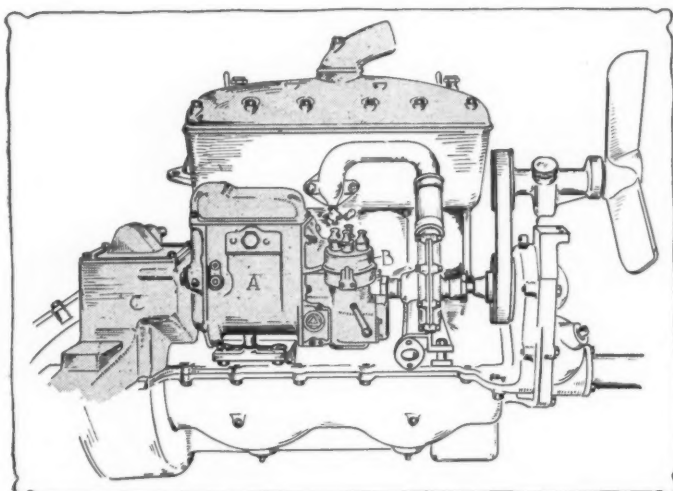


Brake horsepower curve of the new Hazard motors. Maximum horsepower is developed at 1,550 revolutions per minute, the 4-inch motor producing 29, and the 3.75-inch motor 27. Maximum output occurs a little beyond 2,000 revolutions

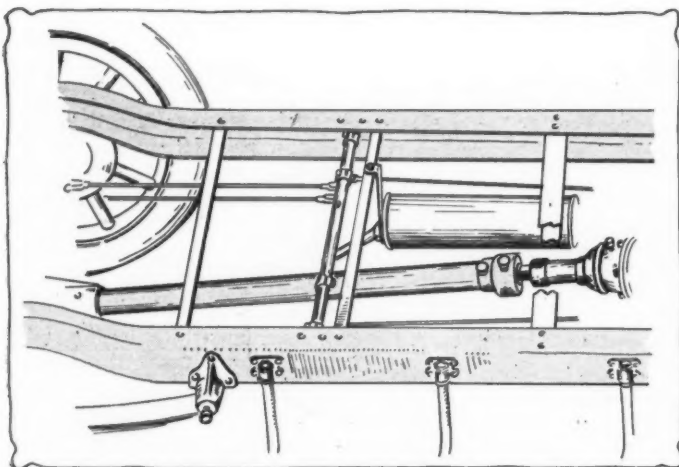


Upper—Paterson 1914 car as a roadster, called Model 32. This car has left drive and center control and is equipped with the Delco electric system. It sells for \$1,147

Lower—Model 33, the touring car, is a five-passenger type and has the same general characteristics as the roadster. Its price is \$1,197



Right side of Paterson motor, showing mounting of Delco unit A with ignition distributor B and reduction gearing to flywheel housed within C



Construction of torsion tube and its front end. Instead of a yoke, a thrust bearing is used, the drive being through this and the springs

Paterson Has New Design for 1914

One Chassis and Two Body Types, Touring Car and Roadster—Prices Lowered

ONE chassis with two body types—a roadster and a touring car. This is the production policy of the W. A. Paterson Co., Flint, Mich., for 1914. Models 43 and 47, which were both four-cylinder cars, have been dropped entirely, the latest Paterson being a brand new job.

And along with a policy of greater specialization which is reflected in the turning out of a single chassis, this Flint maker, which, by the way, has been in the vehicle business for 45 years, making carriages when the automobile of today was only a dream, has pinned its faith to the low priced market rather than catering to the medium-price class. The 1914 Paterson is priced at \$1,197 with touring body and \$50 less as a roadster. The 1913 models' prices were \$1,685 for model 43 and \$1,985 for model 47.

The new Paterson, which is called model 32 as a roadster and model 33 as a touring car, is composed of a number of units of well known make. It has, for instance, a Northway motor to which is fitted the combination electric cranking, lighting and ignition unit of the Delco make, Weston-Mott axles, Jacox steering gear and other parts which are by-words to the trade.

The wheelbase of the car is 112 inches and the length has been so distributed and the body so designed that plenty of room is given for each of the car's occupants. Doors have been made wide enough for easy entrance and exit under all conditions. These are points which must not be overlooked in the well designed car of today. Prospective buyers know that the mechanism of the modern motor car is apt to be all that could be desired, hence they are turning more and more to the consideration of the details which make for comfort and convenience.

Two-Unit Construction

The principle of the Paterson chassis design is the two-unit construction whereby the motor, clutch and gearset comprise the forward unit and the rear is made up of the rear axle assembly consisting of the final drive and the differential gears. This construction is very prevalent in motor car design, making quick assembly possible and at the same time lending greatly to simplicity and efficiency.

The motor is the standard Northway type of 3.5 inches bore and 5 inches stroke. Its piston displacement is 192.4 cubic inches and its stroke bore ratio 1.43. This long stroke feature gives the motor a horsepower of 28 on the block although the standard formula of the S. A. E. accords it only 20 horsepower.

The cylinders have L-heads and are cast in a block. The upper half of the crankcase is in unit with the cylinder casting and carries the three crankshaft mountings. A distinctive feature is the removable plate at the top which is really the head for each of the cylinders. This head carries the spark plugs, the priming cups and the water outlet connection.

Valves and intake and exhaust manifolds are on the left side, there being an individual opening into each cylinder from the exhaust header while one connection for each two cylinders suffices for the intake. Two plates inclose the valve mechanisms completely. These covers incorporate the latest in crankcase breathers. There is an opening through each cover which allows the air within to communicate with that outside. The breathing takes place through the valve tappets and thence out through these cover passages into the open.

All of the reciprocating parts are made as light as possible to

be consistent with the work they have to do. They are also very carefully balanced so as to reduce vibrations to the minimum, to add to the power developed and to decrease wear. The pistons are constructed of special cast iron and are each fitted with three eccentric piston rings which are pinned to keep them from turning. These pistons are 4 1-2 inches long and the rings 1-4 inch wide.

The lubrication of the Paterson motor is by the constant-level splash arrangement. The lower half of the crankcase is divided into pits by low walls and the oil is at constant level under all road conditions, it is said. This gives each connecting rod scoop an equal dip. Specially designed dippers with which the connecting rods are provided carry the oil up to the connecting-rod bearings, while a system of grooves cast in the side of the crankcase conveys the oil in turn to each compartment or trough as it is splashed against these crankcase walls. Oil is pumped from the reservoir at the bottom to the crankcase by a positively driven plunger pump.

The cooling of the engine is made very efficient by the use of large water jacket spaces, a centrifugal pump mounted on the right side of the motor and a cellular radiator of the Long make. The water connections are large so as not to impede the circulation in any way.

The combination Delco unit which takes care of all of the electric requirements is mounted on the right side of the engine and back of the water pump, to the extension of the shaft of which it is connected when being driven as a generator. In the Delco design used, the ignition distributor is integral with the motor-generator at the front end. When operating to crank the engine, the unit receives its current in the usual way from the storage battery, the electric switch and the reduction gearing mechanism being so interconnected that when the current goes to the motor, the gears shift into mesh with the flywheel and thereby turn the crankshaft.

The reduction gearing between motor and engine is housed integral with the flywheel housing and consists of two sets of gears which are shifted when connection is required. The shifting gears are on a countershaft and mesh with both the flywheel gear and the motor pinion at the same time. Thus except when in cranking position there are no gears in mesh to be noisy. A clutch mechanism disconnects the generator drive at the other end when the electric unit is operating as a cranking motor.

With this electrical apparatus, a 6-volt, 100-ampere-hour Exide storage battery is supplied. This is carried on the right side of the gearbox and inside of the frame.

The clutch is of the cone type and leather faced with spring

inserts to assist in easy engagement. It acts within the flywheel which has a diameter of 14 inches and a face width of 4 1-4 inches. As with all conventional unit power plants, the gearbox containing gears for three speed combinations and reverse bolts to the rear of the flywheel housing through a flange. This gearset is of the selective type and is mounted on ball bearings throughout. The gears and shafts are constructed of chrome-nickel steel.

The new Paterson has a very efficient drive to the rear axle. Fitted with a Spicer universal joint at the front end, it enters the torsion tube just back of this part. The torsion tube, instead of having a yoked front end, each arm of which yoke construction bolts to a cross-member, as in the ordinary practice with this type of drive, does away with a yoke and makes use of a thrust bearing on the propeller shaft at its front end.

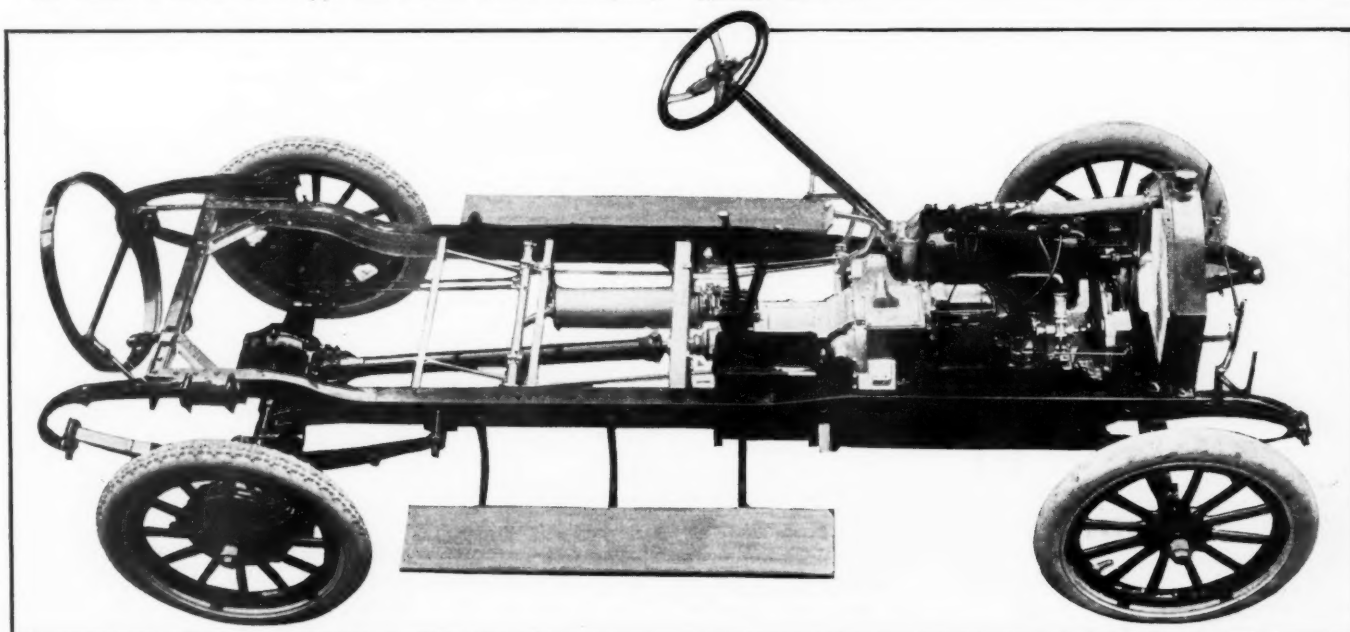
The rear axle is floating and has nickel steel shafts 1 1-4 inch in diameter. Its differential gears are made of carbon steel and the drive pinion from nickel steel. The bearings are Hyatts throughout. Internal and external brakes are fitted acting on the wheel drums. They are 12 inches in diameter and 2 1-4 inches wide.

Left Drive and Center Control

Left drive and center control are fitted. The Jacox steering gear used is of the irreversible type, operating through the use of a worm and double nut. The wheels are of the artillery type and fitted with 32 by 3 1-2 inch tires, front and rear, which are mounted on demountable rims. The touring car carries a 14-gallon gasoline tank under the front seat, while the roadster fuel reservoir is placed back of the seat. It has a capacity of 27 gallons. Paterson bodies are of the flush-side design with no door handles or exposed hinges. The running boards are clear of everything. The roadster seat is 40 inches long. There is a distance of 29 inches between its front edge and the sloping front floor board, giving plenty of leg room. Doors are 19 inches wide. A feature of the motor design is the provision made on the front of the timing gear housing for the mounting of a tire pump. With tanks filled and complete equipment, the Paterson touring car weighs 2,680 pounds, while the roadster in similar condition tips the scales at 2,410 pounds.

The principal bearing sizes of the motor are:

Front crankshaft bearing.....	1 3/4 inch diameter by 3 3/4 inches long
Center crankshaft bearing.....	1 1/2 inch diameter by 2 3/4 inches long
Rear crankshaft bearing.....	1 15/16 inch diameter by 3 7/16 inches long
Connecting-rod lower bearings.....	1 1/4 inch diameter by 2 1/4 inches long
Front camshaft bearing.....	1 1/4 inch diameter by 2 inches long
Center camshaft bearing.....	1 1/16 inch diameter by 1 inch long
Rear camshaft bearing.....	1 inch diameter by 1 3/4 inch long
Camshaft diameter.....	1 inch



Paterson chassis for 1914. Note two-unit construction, strong frame and tire carrier in the rear



Upper—Model B Detroit touring car with sloping hood, new radiator and electric system, and selling for \$1,050
Lower—New speedster type brought out for 1914

Detroit Adds Model B

Has Sloping Hood and Rounded Radiator —Series A Cars Continued

ALTHOUGH the Briggs-Detroit Co., maker of the Detroit car, does not adhere to the annual model idea and constructs its cars in thousand lots, it has added to its series A models which are continued as heretofore, a series B car which has a new body with sloping cowl and a new design of radiator, though built around the standard Detroit chassis.

This new Detroit is up to the minute in every particular and shows all of the latest body ideas, as well as presenting a most attractive appearance. The new radiator with rounded and convex front and top adds much to the looks of the new dress, as does the slope of the body to the hood line without break.

The model B is fitted only with the Detroit-Remy electric cranking and lighting system and sells for \$1,050 with full equipment. Its chassis is identical with that of the model A cars.

Speedster Has Been Added

In addition to this new model, a speedster has also been added. This is a very pleasing design of the open car type and has sloped seats for the two passengers. The steering wheel is given considerable rake, while the hood is sloped downward to the radiator. The dash has the slope common to the speedster type of car, while at the rear of the seat is the gasoline tank and back of that a drum for the carrying of one or two spare tires. This model, too, is fitted to the regular chassis, has the same motor and other features, though tuned up for speed work, of course.

The standard foredoor Detroit roadster of the model A type is also retained, and like the model A touring car has three different model designations dependent upon the equipment. Thus, model A-1 and A-3 refer to the touring car and roadster, respectively, when fitted with Prest-O-Lite acetylene tank or acetylene generator and oil side and tail lamps and the price is \$900. Model A-2 is the same touring car, and model A-4 the

same roadster, but they are equipped with electric lights throughout, which are operated from a storage battery. They are listed at \$900 also. When touring car and roadster of the A series are provided with the Detroit-Remy electric cranking, lighting and ignition system, they sell for \$1,025 and are designated as models A-5 and A-6, respectively.

The speedster is also listed at \$900 with either the Prest-O-Lite tank and oil lamp combination, or the electric lighting from storage battery, while for \$1,025 it may be had with the regular cranking, lighting and ignition outfit as fitted to the other cars.

Besides the addition of electric cranking and electric lighting from a generator, practically the only change of note in the standard Detroit chassis of 104 inches wheelbase, around which all of these body models are fitted, is the use of a larger motor which in the main conforms to the same general design as that of the power plant formerly used.

New Motor More Powerful

But the new engine with its bore of 3.5 inches and stroke of 5 inches develops 32 horsepower, whereas the former motor with dimensions of 3 3-8 by 4 3-4 inches was rated by the maker at about 25 horsepower. The S. A. E. formula gives the new engine 19.6 horsepower as against 18.25 for the old, but the greater actual difference is due to the longer stroke. The piston displacement is raised by this and the slightly larger bore from 170 cubic inches to 192.4, while the stroke-bore ratio is now 1.43 as compared with its former value of 1.405. Perusal of specifications of a number of well known makes of both fours and light sixes will reveal the fact that these new cylinder dimensions which the Briggs-Detroit concern has adopted are being quite generally used.

The cylinders are cast in a single block with water jackets integral and valves all on the right and inclosed by a single valve cover plate. The simplicity of the motor design is readily apparent from a glance at the motor views. The gearset and clutch are in unit with the engine proper, the whole being suspended at three points. The barrel form of crankcase is made use of with the oil sump bolting to the bottom.

Looking at the engine as a whole, only one manifold appears on the valve side, this being the exhaust pipe. The carbureter and its intake connection to the cylinder block are on the opposite side, the inlet passages going through the casting itself to the opposite side. They do not pass through the water jackets, but below them and thus gas vaporization is materially aided.

Novel Water Inlet and Intake Pipe

The new motor has a novel combined water inlet connection to the jackets and carbureter intake pipe. The gas passages to the cylinder casting from the carbureter are surrounded in jacket form by the water passage. The hose connection from this assembly runs off at the front side. This construction makes a very neat and compact whole, and further aids vaporization of the fuel. In the old motor, these connections were entirely separate.

The crankshaft turns on two ball bearings of large proportions, one being well mounted in either end of the crankcase. The crankshaft itself is of large proportions, being a drop forging of high carbon steel. Its generous proportions preclude any possibility of whipping or vibration. The connecting-rods are drop forgings also and like the crankshaft are carefully balanced. The lower connecting-rod bearings measure 1 7-8 by 1 7-8 inches. Pistons are made of seasoned grey iron and carry three eccentric rings each. They measure 4 3-4 inches in length. Special emphasis is placed by the concern on the fact that these pistons are worked to .0005 limits and each set of four for any one motor are matched so as to weigh alike. This is a factor which makes for smooth running and absence of vibration.

The camshaft is a drop forging which has its cams integral. There are three bearings which like those of the crankshaft are of substantial proportions. They are all ground to a diameter of 0.937 inch, while the ends have a length of 2 1-2

inches and the center bearing is 1 1-4 inch long. The valves are on the right, and have grey iron heads welded to low carbon steel stems. This is said to be a combination which will not warp or pit. The push rods operate in bronze bushings, while conventional means is provided for adjustment of the tappets. The helical timing gears are placed in the rear of the crankcase just forward of the flywheel.

Thermo-Syphon Cooling

The cooling is by thermo-syphon, the jacket spaces around the cylinders being large and free from obstructions. Water outlet and inlet connections to the vertical tube radiator are each 2 inches in diameter which allows the cooling fluid to flow freely. The radiator is in three tiers and measures 24 by 26 inches.

The oiling system of the Detroit motor is rather unusual in that it really consists of two systems. A force feed pump draws oil from the reservoir at the bottom of the crankcase through a sight feed on the dash and thence to the front end of the crankcase. From here it is distributed to the troughs under the connecting rods. In their reciprocation, the ends of these rods dip into the oil in the troughs and splash it up into the cylinders and all other contact surfaces. It later runs back into the sump for recirculation after being strained. A secondary system is used whereby the flywheel runs constantly in a bath of oil, throwing the lubricant by centrifugal force throughout the clutch parts and back into the gearset.

Specially-Designed Electric System

The cranking and lighting system which is optionally fitted to the Detroiters of series A and is standard on model B cars, is a specially designed Remy outfit of the two-unit form. That is, the cranking motor is separate entirely from the electric generator, which has incorporated with it a distributor so that ignition is supplied from the same source. The generator is located on a bracket on the right side of the engine and is driven from a gear in mesh with the camshaft gear. This driving mechanism is completely housed by an extension of the flywheel cover.

The electric motor is placed transversely and at the front of the engine. On the end of its shaft is a worm which meshes with a worm wheel on the crankshaft. This method of worm drive of the cranking mechanism is rather uncommon. It makes an exceedingly neat installation and places the electric motor out of the way, although at the same time it is very accessible. The worm gears are completely housed in, and with the drive there is incorporated a clutch which disconnects cranking motor from engine as soon as the latter starts to move under its own power faster than the former drives it. In ordinary operation, this cranking device spins the crankshaft at about 150 revolutions a minute, which should make starting very positive. In order to combat wear and prevent breakage, the worm gear is constructed on phosphor bronze, while the worm is of steel.

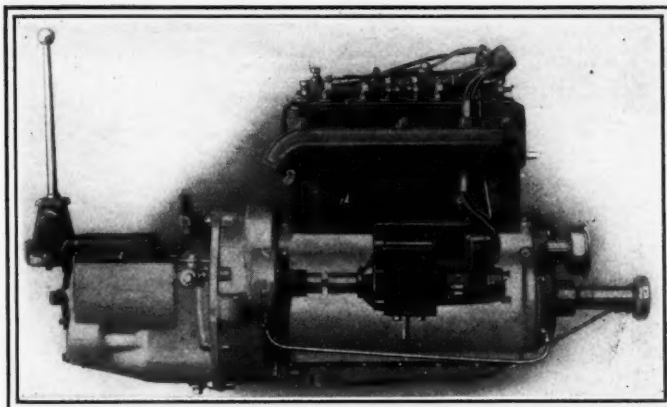
To operate the starter, a pedal in the drive compartment is pressed, after the ignition current has been switched on. This sends current from the storage battery to the electric motor, which drives in the way already mentioned.

Gearbox Is Accessible

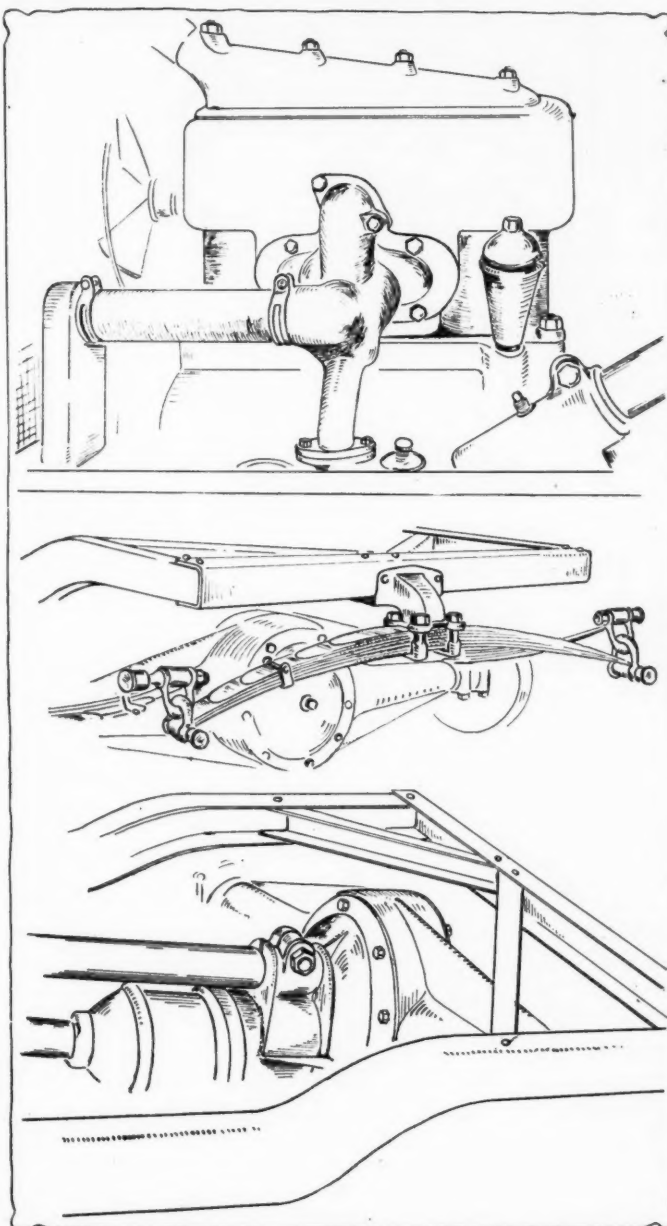
The gearset bolts to the rear of the flywheel housing through a flange, and the gearbox itself is specially well designed so that access to the parts within is readily obtained through a large cover. There are three forward speeds and reverse, selectively obtained. The gears are of 3-4 inch face and constructed of carbon steel, heat treated. Annular ball bearings carry the mainshaft and countershaft. For economy of space, the clutch is placed within the flywheel. It has 12 internal and 11 external crucible steel disks and runs in oil.

Drive to the rear is through a propeller shaft of large proportions which has a universal joint at either end. Instead of having the torsion arm at one side of this drive member as is usually the case with this type of drive, the torsion arm, which is cir-

(Continued on page 1219)



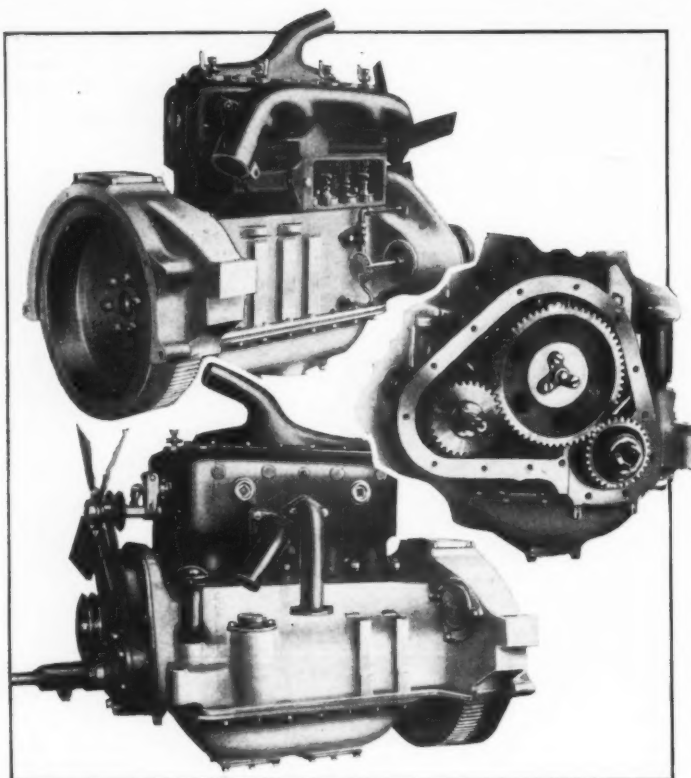
Right side of new Detroit motor, showing mounting of electric generator and ignition device



Top—Combined water inlet pipe and motor fuel intake. The water passes around the fuel intake and aids in vaporization

Middle—Platform rear spring suspension of Detroit. Each spring is 1.75 inches wide and 37 inches long

Bottom—Rear end of torque rod on Detroit, showing substantial mounting in a socket which is integral with the axle housing



Top—Right side of Continental Baby motor, showing inclosed valves. Right—View of timing gears in case. Bottom—Left side of motor, showing clean casting

Continental Has Baby Model Motor

**Weights Only 380 Pounds—
Bore of 3.5 Inches and Stroke of 5**

FOLLOWING the European tendency towards motors of small bore, long stroke and high economy, the Continental Motor Mfg. Co., Detroit, Mich., has brought out a baby four-cylinder motor with L-head, block-cast cylinders and weighing only 380 pounds. It is designed for the typical \$1,000 car, has a bore of 3.5 inches and a stroke of 5 inches, these dimensions giving it an S. A. E. rating of 20.2 horsepower, although better than 32 horsepower has been developed by this motor on the testing block at a speed of 2,000 revolutions per minute. Model N is furnished in either unit power plant or independent constructions and will accommodate any standard carbureter and magneto, and several well-known starting and lighting systems. Cooling is by the thermo-syphon system and lubrication is by splash.

All Parts Are Light and Strong

Great effort has been expended to make this motor as light as possible and still not weaken it in any particular. The pistons are four inches long and the walls .094 inches in thickness. The ribs found necessary in larger pistons to reinforce them are not required for this diameter and have therefore been omitted. Another big reduction in weight has been effected by the substitution of pressed steel for aluminum in the oil pan.

Both intake and exhaust valves are located on the right and are inclosed. The magneto is also placed on this side, although it is not shown in the illustration, but the bosses used in its mounting and the coupling for driving it are to be seen. The carbureter is on the left. It has a 1.25-inch opening and sup-

plies the cylinders through a manifold that is integral with the cylinder casting. At the front is the crankcase breather and directly behind it is an oil indicator.

Following standard Continental practice model N is designed for either three- or four-point suspension; in the former case the third point is around the starting crank housing while lugs are cast on where four-point is desired.

This model is furnished with unit or separate powerplant construction. With the former, the rear of the crankcase is formed into a bell-shaped housing inclosing the top of the flywheel and to which the gearbox is bolted. The four-bladed fan is driven by a V-belt and is mounted on a bracket attached to the front end of the cylinder casting.

The usual Continental combination splash and force feed oiling system is used, a positive plunger pump operated by an eccentric on the camshaft forcing oil directly to the timing gears and over the rear main bearing, from which points the connecting-rod troughs are supplied.

Inlet and Exhaust Valves Interchangeable

Turning now to the interior construction of the motor, the inlet and exhaust valves are interchangeable and measure 1.0625 inches in diameter. They have nickel steel heads, electrically welded to carbon steel stems, .375 inch in diameter. Both seats and stems are accurately ground to size and the stems' ends are hardened to prevent undue wear caused by tappet action. The timing is as follows: Intake opens 17.9 degrees late, remains open 191.5 degrees and closes 29.4 degrees late. Exhaust opens 42.5 degrees early, remains open 231 degrees and closes 8.3 degrees late. The cylinders fire in the order 1—3—4—2.

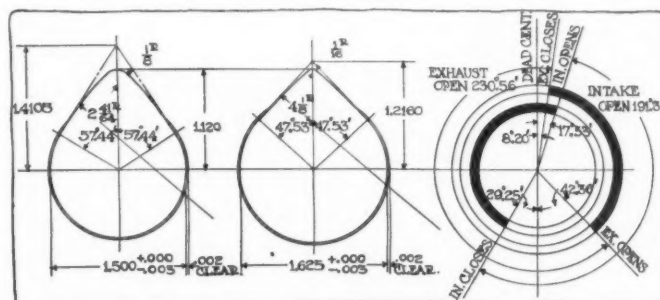
The camshaft is driven through helical gears and is drop forged from a single piece of low carbon steel with the cams integral on the shaft. This shaft runs in long white bronze bearings and is lubricated by the oil that collects in the oil pockets which are cast in the crankcase for this purpose.

This shaft, after being carefully turned and having the cams rough machined, and annealed, is subjected to a special process of heat treating, which thoroughly hardens it. It is then finish-ground to size on a special camshaft grinding machine.

Camshaft dimensions are as follows, diameter occurring first: front 2.625 inches by 1.4375 inches; middle 2.21875 by 2.50 inches; rear 1.50 by 1.75 inches.

Three rings are used on the pistons, each .1875 inches wide and are carefully ground on all faces. Connecting-rods are of I-beam section made from .35 to .45 carbon steel, drop forged and heat treated to give stiffness and to prevent crystallization. They are bored and reamed on special tools which insure correct centers and alignment. Piston pins are of chrome-nickel steel, hardened and ground. Wristpin bearings are bushed with phosphor bronze and measure 1.94 by 1.5 inches. Crankpin bearings are 1.875 inches in diameter by 2.1875 inches long.

A three-bearing crankshaft is used with a flange at the rear to which the flywheel is held by six bolts. It is made of .40 carbon steel drop forged and heat treated and having a tensile strength of 90,000 pounds per square inch. Main bearings lined with nickel steel babbitt are employed, the linings being held in place by brass retaining screws.



Cam contours and timing diagram of new Baby Continental motor

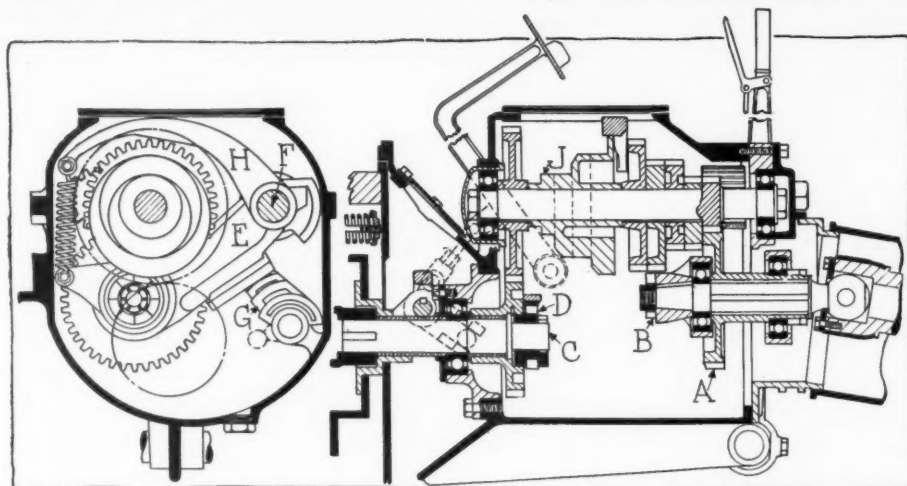


Fig. 1—Left, cross-section through gearbox, looking to rear. Fig. 2—Right, vertical section through plane of mainshaft

Ross Gearset Does Away with Clashing

Four-Speed Sliding Gearset with Gears Always in Mesh—Countershaft Drive by Master Gear

A FOUR-SPEED sliding gearset in which the gears are constantly in mesh, making for silence in gear changing and eliminating the possibility of gear stripping is the novel product of the Ross Transmission Gear Co., Detroit, Mich. The general construction of this device is shown in Figs. 1 and 2, Fig. 1 being a cross-section through the front of the gearbox looking to the rear, and Fig. 2 a vertical section through the axis of the mainshaft. This design resembles the ordinary gearset in that it has a countershaft which is driven by a gear on the forward end of the main or clutch shaft.

The peculiar features possessed by this gearset are due largely to the method of transmitting the power from the countershaft back to the rear end of the mainshaft. This is accomplished by a master gear A, on the latter shaft, which can be moved into mesh with the various countershaft gears to give first, second, third and reverse speeds. Direct drive on fourth is obtained by connecting the clutch shaft and the master gearshaft by means of the dog clutch. The mechanism by which the master gear is shifted to its various positions will be described later, but first an explanation of how the various forward speeds are obtained will be given, beginning with the master gear in engagement with the low gear on the countershaft as shown in Fig. 2.

Between first and second, and second and third speed countershaft gears, there are eccentric gears whose teeth are in alignment with the lower gear on one side and with the higher gear on the other, as clearly shown in Fig. 3. In shifting from first

to second, for example, the master gear first slips into engagement with the lower side of the eccentric gear, then after one-half revolution of the countershaft, the side of the eccentric gear that has its teeth in alignment with the second speed gear becomes tangent to the master gear, thus allowing the latter to slide into mesh with the second speed countershaft gear. Progression from second to third speed is accomplished in a similar manner.

Direct drive on fourth speed is obtained by the engagement of dog clutch members B and C, Fig. 2. This is accomplished by sliding B 1-2 inch forward and C about the same distance to the rear. On direct drive, the master gear is still partly in mesh with third gear as this serves to locate the two ends of the mainshaft for engaging direct drive. The movement of C to the rear also disengages the dog clutch D through which the countershaft drive is effected.

Master Gearshaft Runs on Ball Bearings

The master gearshaft is carried on annular ball bearings which are held by the two arms E, Fig. 1. These arms being pivoted on the shaft F and the cam G holding the master gear firmly in engagement by pressing on the flat plate located on the backs of these arms. This cam is rocked out of engagement when the clutch pedal is depressed, thus allowing gearshifting to take place. When the pressure of the cam is removed, the master gearshaft is held in place by the tension of the spring connecting the bell crank arm H with the arm E.

Gearshifting to the rear excepting when the teeth are in alignment is prevented by this arm H which rides on a series of eccentric and concentric cams that correspond exactly to the countershaft gears, as shown at J, Fig. 2, and in more detail in Fig. 4. The elevation, Fig. 4, shows the necessity of this construction. If shifting, say, from third to second were done with the master gear in the position shown, the master gear would strike second gear with enough force to make a disagreeable noise, if not do some actual damage.

There is only one neutral position in the gear-box and this is had by shifting the master gear 3-4 of an inch to the right of the position shown in Fig. 2.

Reverse speed is obtained by bringing the master gear to the extreme right position and meshing it with the pinion K, illustrated in Fig. 5.

With a 3.5 to 1 rear axle ratio the gearbox affords deductions of 4.95 to 1 on third, 7.95 to 1 on second and 13.03 to 1 on slow and reverse speed.

Shifting can be done by means of a hand lever or by a pneumatic or electric gearshift, with the latter only two buttons are needed, one for forward shifts and one for backward. The advantages claimed for this gearset are that changing is more quickly, quietly and easily accomplished, and that the gears are always in adjustment.

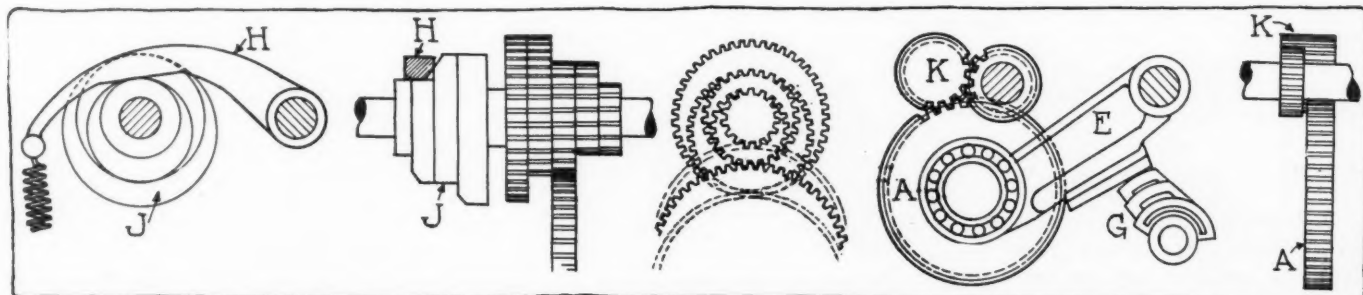


Fig. 3—Center, how master gear meshes with countershaft gears. Fig. 4—Left of center, countershaft assembly, showing eccentrics and arm. Fig. 5—Right of center, reverse gear train

Fuel Consumption by Electric Generator

Readers Hold That Electric Lighting and Starting Systems Are Not Wasteful—R. H. Coombs on Packard Test

WOODSFIELD, OHIO—Editor THE AUTOMOBILE:—I see that R. H. Coombs is in print in your issue for December 11. This last letter of his has a much more practical tone to the ears of a practical mechanic than a former letter which I answered. After all that has been said in this last letter about the Packard test, etc., it can be condensed to a few lines. Namely, that, with a dynamo absorbing a definite amount of power from the engine, whether it is a large or small one, the load is inversely proportional to the engine's capacity, or, to state it in another way, if it required 20 per cent. of the engine's capacity to drive the dynamo on a 40 horsepower engine it would require 40 per cent. of the engine's capacity rated at 20 horsepower. This is sensible and logical.

If you will refer to my letter of August 21 in THE AUTOMOBILE, I made the assertion that to my mind the electric lighting would never supersede the gas lighting on the lower-priced cars. It was on this very ground that I made that statement that, when you get down to the extra-small motors such as are used on the cyclecars, etc., such a per cent. of the engine's total output is absorbed in the dynamo that the game is not worth the candle, but for the higher-powered and passenger class the day of arguing against electric lighting and starting is past.

I would like to answer R. M. Newbold in this same issue of your paper. I wish he would be a little more explicit in what he means when he states that "Lamp voltage is important." We all know it is important and Mr. Newbold puts up a fine argument which I will vouch for up to the above point of lamp voltage.

Lamps Floated on Line Efficient

If there is anything that has finer regulation than a lamp load when a storage battery is floated on the line you will have to go to a laboratory to find it. There are very few things in existence whether electrical or not that have as high a degree of efficiency in automatic regulation as lamps burning from a circuit on which is floated a storage battery.

Of course there would be a considerable variation from a fully-charged battery and one nearing total exhaustion but such a wide range is totally uncalled-for with the average equipment.

Remember that if the voltage of the dynamo should rise above the voltage of the battery it begins charging and if the lamps are burning at the same time any voltage above what the lamps are burning at will be absorbed by the battery. Furthermore, the tungsten lamps used in automobile lighting have high inherent regulation within themselves which is exactly the reverse with the common carbon lamps.

All the slight variations you will find in the average lighting systems of the modern automobile the lamps themselves are fully able to handle. Neither Mr. Newbold, Mr. Coombs nor any person has a right to criticise lamp performance when it comes to nicety of regulation. There is nothing half-baked about it, but on the other hand it is one of the most ideal features of the whole electric system.—J. K. MERCER.

Thinks Electric System Is Most Economical for Medium-Priced Cars

ST. LOUIS, MO.—Editor THE AUTOMOBILE:—In THE AUTOMOBILE for December 11 R. H. Coombs calls attention to the tests made by the Packard Motor Car Co., regarding the losses of the electrical equipment, and also to the test made by

the Prest-O-Lite Co. at the Speedway in Indianapolis, last summer.

After reading the different articles in your paper from time to time on this subject, by different writers, it seems to me someone should give the subject an airing and explain a few of Mr. Coombs' remarks so they would be a little more simple to the intending buyer of a moderate-priced car, as Mr. Coombs has granted that the buyer of a Packard, or other high-priced car does not care about the extra consumption of gasoline taken to operate the electric generator.

The average medium-priced car has a small bore engine, and with its light weight gives a better mileage per gallon of gasoline than the high-priced, high-powered car. The electric generator on the medium-priced car is accordingly smaller in proportion, therefore it stands to reason that its losses will be approximately in proportion to the larger type.

Now a small moderate-priced medium-powered car seating five passengers will tour over ordinary roads on not to exceed 1 gallon of gasoline consumption to every 15 miles traveled. If we put this car in daily service, starting, stopping, etc., for a distance of 1,200 miles, it would have consumed 80 gallons of gasoline.

Here in St. Louis gasoline is now selling for 14 cents per gallon. Assuming the generator loss is 12 per cent. maximum as Mr. Coombs states their tests show, we will take 12 per cent. of the gasoline used during the 1,200 miles traveled, which would be 96 gallons of gasoline, and, at a cost of 14 cents per gallon, the convenience of the electric lights, and cranking system has only cost the user \$1.34 for the 1,200 miles of travel.

If any other lighting system can give a better light, with the same convenience of the cranking system included, at a cost of \$1.34 per 1,200 miles of travel, why not give the public the actual cost figures of operation, instead of "knocking" the electric systems, trying to mislead the prospective buyer of a medium-priced car?

Taking the two lighting systems, the electric and gas, will Mr. Coombs please give the readers of THE AUTOMOBILE the actual cost of lighting per hour on the medium-priced car?—F. S. WIEMEYER, Buick Motor Co., St. Louis Branch.

Acetylene Man Considers Knowledge of Starter Necessary To Understand Test

INDIANAPOLIS, IND., Editor THE AUTOMOBILE:—Upon a careful reading of the official report of the Packard test on the Long Island Speedway, I find there are two matters which seem to have escaped attention entirely, and which are really important to a correct understanding of the matter under test.

You will note that the car being tested was run with a serious overload of weight in the car, such as spare tires, tools, etc., also with five passengers, and in addition, with the top, windshield and all side curtains up. The consensus of opinion among the various writers in describing the Packard test seems to be that these severe conditions of engine load tended toward extreme accuracy in determining the percentage of power consumed by the electric generator. The fact is that the reverse is true.

Since the power consumed by the generator is approximately a fixed load at normal engine speeds, any condition which compels the engine to consume a larger amount of fuel in propelling the

car itself, reduces the percentage of consumption by the generator.

By way of illustration: Let us assume that the car in covering a certain distance under a certain load consumed 20 gallons of gasoline, of which the generator absorbed 1 gallon, or 5 per cent., which is the approximate showing in the Packard test at 20 miles an hour. Now let us assume that in going over the same distance with only half the load and under other more favorable conditions, the very same car consumed 10 gallons of gasoline. In this latter case the one gallon consumed by the generator would become 10 per cent. instead of 5 per cent. of the total fuel consumption.

It is perhaps true that this condition in the Packard test which favored a showing of a low percentage as compared to what might be the case under conditions of daily service in fair weather, may have been offset to a degree, and perhaps entirely offset, by other conditions with which I am not familiar. But I cite the above illustration in the effort to correct any wrong impression that the unusual load carried in the car and the unusual running conditions due to wind resistance, tended toward accuracy.

The fact that the Packard in this test ran with its lamps lighted, may mean something in the case of the Packard, or it may not, and it may mean something in the case of some other car, or it may not. This all depends on whether the lamp load increases the output of the dynamo and this depends upon the electric system used. If the coils in the Bijur generator are so wound as to increase the output of the generator under this condition, then the fact would seem to be significant in the case of the Packard, but please note that this applies to the Packard only. In any system where such provision was not made, the carrying of the lamp load might depend in its effect entirely upon the condition of the battery, not only with respect to its physical condition, but also with respect to its condition of charge, and this in turn varies in the case of almost every individual car owner, depending as it does, upon whether or not he operates his car sufficiently at generating speed during the daytime to keep the battery approximately fully charged, and also depending upon how much he uses his light by night. Those who are more familiar than I am with the minute details of the Bijur system are able to make any necessary inferences in the case of the Packard, but such an inference could not be extended to other cars without knowing in each instance the details of the generator construction and the approximate accuracy of the current regulation.

These comments are not made with any desire to criticize the Packard test, because I realize that this test was probably as accurate as any road test can be, and because its general result confirms the tests made on the Indianapolis Motor Speedway last summer. But in view of the comment which has already been made on the Packard test, by various writers, the foregoing may assist all of us in getting the greatest possible benefit from the test, by seeing it from all its angles.—R. H. COOMBS, Prest-O-Lite Co., Inc.

English Engineer Claims Starter Gives 2 Miles More Per Gallon of Fuel

NIAGARA FALLS, N. Y.—Editor THE AUTOMOBILE:—We are sending herewith copy of a letter written by Sydney Smith, of the Sheffield-Simplex Motor Works, Ltd., England, to the *Autocar* on the subject of gasoline saved in driving a car equipped with an electric starter.

This letter, coming as it does from an engineer of high standing in England, we believe will be of great interest to American manufacturers and car owners. The substance of the letter is as follows:

"I have been wondering whether it is sufficiently realized by the general public and even the trade and press what a considerable saving in gasoline is really brought about by the possession of a self-starter on a car.

"We have now a starter to our engine and I have had under personal observation one of our cars so fitted since last April.

"I must admit, that at first, it never occurred to any of us that it would turn out much more than a great labor saver by obviating cranking the engine. It was an agreeable surprise, therefore, to find extra mileage per gallon of fuel. I do not know whether this view has occurred to you, but it is really a very important one to motorists in view of our common enemy, the gasoline companies, and ought to be more widely known.

"The fact is that everyone uses an enormous amount of fuel without covering any miles. For instance, on account of the trouble of starting, an engine is generally allowed to run when waiting outside a door; also the engine must be started before the driver is in position; also the engine is frequently run faster than is really necessary on account of the fear that it may stop and have to be re-started.

"But with a self-starter, immediately the destination is reached the engine can be switched off with the throttle lever in the slow running position, and it need not be re-stated until the driver is back in his seat with rugs arranged and everything ready for traveling, and the position of the throttle need not be altered. This obviates racing the engine and wasting fuel.

"There is also not the dread of stopping the engine, because if the engine is stopped there is no difficulty in pressing a pedal to re-start it, and consequently it may be set to run more slowly.

"My experience so far shows that we get an increase of a little more than 2 miles to the gallon, merely by the engine possessing the self-starter, and the cumulative effect at the end of the year of an increase of 2 miles to the gallon in a car that is used much, really becomes a paying proposition, in addition to the avoidance of the labor of starting."

Detroit Adds Model B

(Continued from page 1215)

cular in section, is disposed directly above the propeller shaft, running from the center cross-member of the frame back to a substantial mounting which is a part of the rear axle housing. This construction makes a very nice assembly and puts the drive in direct line with the center of the car. The rear axle which has a webbed pressed steel housing is of the floating type. Within it, the differential and drive pinion assembly are a complete unit by themselves and may be removed without disturbing any of the other parts. The differential proper is carried on two large double row bearings. The rear axle ratio is 4 to 1. Brakes are of the double internal expanding type. The service brakes act on the outer of two drums and have a diameter of 14 inches, while the emergency brakes act on 10-inch drums. Both of these are 1 1/2 inch wide.

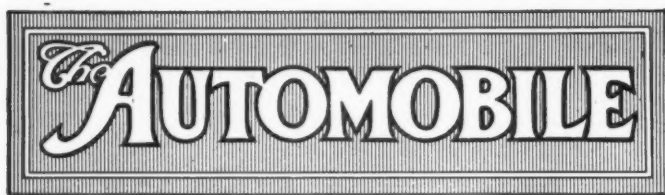
Frame Is Unusually Strong

The Detroit frame is conspicuous for its strength. It has a rear width of 33 inches and narrows to 29 inches in front, though bottle-neck construction. The braces are especially strong. The center cross-member, in addition to having exceptional width, is well braced where it joins the side frame rails by means of gusset plates. The rear cross-member also has gusset plates to aid it, besides braces across the corners. A 3-inch drop is given the frame just forward of the rear axle.

Rear springing is of the platform type, there being three half-elliptic members to this construction. The side springs are outside of the frame and shackle at their rear ends to a transverse rear spring which is securely fastened at its center to a bracket attached to the rear cross member of the frame. This is standard construction for the platform variety of suspension. The front springs are semi-elliptic. All have a width of 1 3/4 inch, while the fronts are 36 inches long and the rear members 37 inches in length.

Left Drive and Center Control

Detroit cars have left steer, and the control is in the center. All models are equipped with high-tension ignition apparatus, set spark being retained except in the self-starter cars, which have a variable spark. Equipment is complete and includes 32 by 3 1/2 inch tires.



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C h r i s t m a s t i d e

Ring out old shapes of foul disease,
Ring out the narrowing lust of gold;
Ring out the thousand wars of old,
Ring in the thousand years of peace.

THE condition of the body politic is measured by the condition of the various units that constitute it. There cannot be a healthy whole without healthy parts; neither can there be unhealthy parts and a healthy whole.

At this Christmas season let us turn the X-rays on ourselves; let each and all conduct an individual clinic. Purge what is unclean, lance the swollen part, remove the decayed bone; put oil in the wound and bandage the weak limbs.

Get ready to start with a clean sheet, with our minds fully made up to do the things we ought to do and leave undone the things we ought not to do. Be prepared to meet the opening of another year, with renewed mental tissue, tissue not contaminated with the poisonous memories of yesterday, but tissue stimulated with the nobler thoughts on which we build tomorrows.

Let us turn over the new page, buy a new volume, and build a bonfire of the old editions. Let us ostracise the "old shapes of foul disease" that have hovered around our presence in our "goings out and comings in" among our industry. Let us play our part in those Christmas chimes that will ring out the wars of yesterday, and that will ring in the peace of tomorrow.

Do It Now Finish It

HOW many of us have been crossing our bridges months before these phantoms were due to present themselves and months before we discovered that they did not exist?

Crossing bridges before we reach them, is but human in that, "to err is human," yet there are times in the careers of all industries when those constituting the industry are more prone to err than at other times. This erring, in attempting to solve propositions that we will never be called upon to even meet face to face, is largely subjective, a creation of the mind, built on imaginings and fed with hallucinations. This erring is often damaging, in that it leads to poorly-directed actions, actions that would not be contemplated for a minute in periods of sober thought.

A retrospect of the year just closing bears examples of many bridges that were present for months out of the 12, but which yet have not been crossed and are further off today than they were 6 months ago. Some have actually crossed their bridges, with fatal results, but the great majority have been marking time and peering ahead wondering what will happen and toiling laboriously to make some ill-timed event take place, which the general tone of the industry could not possibly bring about, but which some individuals think must happen because of the mental fever they have worked themselves into during the past 12 months.

The automobile industry needs sound, sober thought. It needs cool-headed leaders. It needs far-seeing managers, who by able direction establish that confidence which cannot be wavered by the gossip of this or that person, or a few court receiverships.

Only those people stampede who are conscious that they are dropping back in the general progress of an art or industry. They are conscious for months, perhaps, years, that they have not been expending that brain and sinew to keep in the front rank; they are conscious that, in spite of outward appearances, other concerns are forging ahead of them; they are conscious that their engineering force has been out of step with the general music of progression; they are conscious that their factory organization is poorly timed with the necessary production to keep apace with the merchandising end; they are conscious that the overhead costs are double what the business warrants them; and they are conscious that they have not had their ears to the ground, listening for every pulse that would indicate the trend of public demand, so that they would be sure of having the right commodity on the market at the right time.

A good resolution for the new year is "Do it now and finish it." Whatever has to be done, get at it. Don't delay for 6 months or a year. If it should go into the 1914 product, put it in at once and don't delay until 1915. If your engineering staff has overlooked some up-to-date feature in the preliminary announcement of your new models, bury your pride and get it in even if a few months late.

January 1 Issue

Owing to New Years falling on Thursday, THE AUTOMOBILE for January 1 will not be mailed until January 2, which will make it 1 or 2 days late in reaching its readers.

S. A. E. Meeting To Be Held at A. C. A.

Winter Meeting Program Somewhat Revised—Metropolitan Section Talks on Graphite as a Lubricant—Many New Members Already Joining and Big Expansion Planned for Society

NEW YORK CITY, Dec. 23—The annual meeting of the Society of Automobile Engineers will be held January 4, 6 and 8 at the Automobile Club of America instead of at the Grand Central Palace as previously announced. The revised program for the annual meeting is as follows: Sunday, January 4, there will be a reception at the Manhattan Automobile Club, 222 West Fifty-ninth street; Monday, January 5, there will be a meeting of the standards committee at the rooms of the Society at 9 a. m., Tuesday, January 6, will be an all-day session beginning at 9 a. m., at the Automobile Club of America, 47 West Fifty-fourth street. This will comprise the following features: President's address; appointment of tellers for election of officers; treasurer's report; report of tellers of election of members; report of tellers of election of officers; new business. At 11.30 a. m. will come the report of the nomenclature division and at noon the report of the ball and roller bearings division. In the afternoon the brochures division will report at 2 p. m., the electrical equipment division at 2.45, and the reading of papers will begin at 3.30 with Storage Batteries by W. H. Conant. At 4.15 W. J. B. Thomas will read a paper on the Necessity of More Special Data for Electric Car Designers. At 4.30 D. L. Gallop will be heard on Automobile Effectiveness. At 8 p. m. Tuesday, will come the report of the truck standards division, this being the Commercial Vehicle session. The following papers will be read in order: 8.45 p. m., Final Drive for Motor Trucks, by Arthur J. Slade; Internal Gear, by V. V. Torbenson; Double Reduction Live Axle, by B. B. Bachman; Worm Gear by John Younger; and Chain, by H. D. Church. At 10 p. m. Gasoline Locomotives for Mines, by J. A. Anglada; at 10.15 p. m., Development of Electric Tractor for Handling Freight Cars Over Tracks Laid on City Streets, by T. V. Buckwalter; at 10.45 p. m., Taxicab Specifications, by L. P. Prossen.

No sessions are scheduled for Wednesday, January 7, but on Thursday, January 8 at 9 a. m., there will be a report of the miscellaneous division at the Automobile Club of America. At 9.45 a. m., a report of the Pleasure Car Wheels Division. At 10.30 a paper on Radiators will be read by J. W. Cain, followed by one on a Workshop Organization, by Chas. G. Renold and Notes on Scientific Shop Management, by Henry W. Allingham.

The afternoon session on Thursday will comprise the following features: 1 p. m., report of motor testing division; 1.45 p. m., the Exhaust Discharge and Proper Manifold Design, by F. C. Mock; 2.15 p. m., an Electrically-Controlled Dynamometer for Testing Gas Engines, by R. C. Carpenter; 2.45 p. m., report of springs division; 3.15 p. m., Shifting Gears by Electricity, by Frank N. Nutt; 4 p. m., Possibilities of the Cyclecar, by Wm. B. Stout.

Thursday evening the banquet and entertainment will be held at the Hotel Plaza, Fifth avenue and Fifty-ninth street, at 8 o'clock. This will be preceded at 7.30 by an informal reception.

Smith is Trustee for American

INDIANAPOLIS, IND., Dec. 23—Special Telegram—At a hearing before Albert Rabb, referee in bankruptcy in United States Court yesterday afternoon, Frank E. Smith, vice-president and receiver for American Motors Co., was named trustee in bankruptcy. More than 100 creditors from all parts of country attended the

hearing. Smith has qualified by giving \$35,000 bond which may be increased later.

Pope Brings Out 1914 Car

NEW YORK CITY, Dec. 22—The new Pope Mfg. Co. model for 1914 is Model 35. There will be three types of bodies on this chassis. There will be a four-cylinder motor cast in pairs, with chrome nickel steel valves located in the head. Left steering and center control and Rudge-Whitworth wire wheels are used. It has a wheelbase of 118.5 inches.

Metropolitan Engineers Meet

NEW YORK CITY, Dec. 19—Three papers were on the program at the Metropolitan Section Meeting of the Society of Automobile Engineers held here last night. They were entitled, Automobile Greases by W. Jones, an analytical chemist; Graphite by A. Gale Thompson, of the Dixon Crucible Co., and Deflocculated Graphite by Marcus A. Smith of the International Acheson Graphite Co.

Prof. Jones' paper was in the nature of an analysis of thirteen different samples of automobile greases picked up at miscellaneous accessory stores in this city. His findings on these are shown in the accompanying table.

Exception was taken to Professor Jones' statement as regards the amount of ash and the amount of resin which he signified were present in the oil samples.

As the discussion on Professor Jones' paper verged towards the use of graphite the other two papers were read and a general discussion followed on all three.

Mr. Thompson's paper dealt with graphite as a whole. He described it as a mineral and one of the original forms of carbon but stated that it varied considerably in quality, and that many of the forms of it were not valuable as automobile lubricants.

Regarding flake graphite, with which the paper was principally concerned, he stated that the object is to fill the rough spots and then to form a coating over the metal which absolutely prevented metallic contact. The coating was formed due to the fact that graphite has a strong tendency to adhere to metal. Beyond this point he stated that the graphite veneer would not build up because graphite particles had no tendency whatever to adhere to one another. He stated that graphite of the flake variety is valuable for ball bearing lubrication, but that amorphous graphite cuts the balls and races due to its tendency to gather in heaps. He stated that surplus graphite which is consumed in the cylinder leaves a mica residue in the form of an ash.

Graphite Builds Up Surface

Mr. Smith's paper on deflocculated graphite followed immediately. It dealt with the finely subdivided nature of the substance which approaches very strongly the molecular state. By the use of graphite in this form it was pointed out that the inequalities in the metal were built up and the result is a high polish making a non-frictional bearing metal.

The trend of the paper was the use of this kind of graphite.

Sample No.	Grade
1	Stiff
2	Soft
3	Vaseline and graphite
4	Vaseline and graphite
5	Medium
6	Artificial graphite
7	Non-fluid oil*
8	Medium
9	Medium
10	Non-fluid oil*
11	Medium
12	Semi-fluid
13	Very stiff

Melting Point	Remarks
107 degrees F.	Contains .75 per cent. carbonate of soda
200 degrees F.	Contains .72 per cent. carbonate of soda
108 degrees F.	Contains .42 per cent. graphite ash
108 degrees F.	Contains 3 per cent. lime and carb. sod. ash
200 degrees F.	Contains 2.4 per cent. lime ash
200 degrees F.	Contains 1.95 per cent. lime ash
170 degrees F.	Contains 3.7 per cent. lime and carb sod. ash
190 degrees F.	Contains 1.50 per cent. lime ash
190 degrees F.	Contains .95 per cent. lime ash
200 degrees F.	Contains 3 percent. lime and carb. sod. ash
125 degrees F.	Contains .85 per cent. ash
...	Contains no ash, is unmixed mineral oil
225 degrees F.	Contains 6.95 per cent. lime and large amount of resins

*Note—By non-fluid it is not meant to signify oils sold under this trade name.



At Moline-Knight Test—Left to right: F. E. Lanas, Herbert Chase, laboratory engineer, A.C.A.; Prof. E. H. Hutton, Columbia University, director of advertising Moline Auto Co.; L. M. Bradley, D. B. Kilbourne, T. C. Brown, tester; F. N. Funke, W. O. Thomas, chief engineer for C. Y. Knight; W. A. Schuler, C. Y. Knight, designer of Knight sleeve valve motor; A. F. Marshall, chief inspector Moline Auto Co.; H. M. Smith, tester A.C.A.; W. H. Van Dervoort, president Moline Auto Co.; W. A. Linney, tester A.C.A.; J. W. De Lamater of the De Lamater-Byrnes Auto Co., J. W. De Lamater, Jr., and R. O. Butterfield, chief tester Moline Auto Co.

by the engine builder in his assembly work. He stated that a saving of 20 per cent. in time is gained by running in bearings with the use of graphite instead of with oil. To illustrate this he cited an experiment recently made in the factory of the Hupp Motor Car Co., Detroit, in which several engines were run through the belting-in process and test-block work using graphite without the knowledge of the superintendent in direct charge of the work. The time taken on these engines, the numbers of which were known to those in charge, and the result showed the 20 per cent. saving in time as noted. The reason given for this is that the graphite tended to build up immediately a smooth surface instead of the opposite process of breaking down the microscopic metallic points which are originally found in the bearing.

The question was asked if the graphite placed a film between the two metal surfaces and this was answered by Mr. Thompson, who stated that the difference in the two grades of graphite deflocculated and flaked were well brought out here, in that the flake graphite deposits a thin veneer over the surface of the metal whereas in the deflocculated there is no such film.

Difference in Graphite

The discussion brought out that the uses of the two kinds of graphite are different. The flake graphite is put directly in the crankcase of a motor and the turning action of the connecting-rods keeps the flakes in suspension in the lubricating oil. Owing to the fact that the specific gravity of graphite is higher than lubricating oil, there is a tendency for it to settle unless it is under the agitating influence of the connecting-rods and therefore it could not be recommended that that graphite be put in a tank at the rear of the car and pumped forward to the motor because the settling action would cause an unequal distribution of the graphite in the carrying medium.

The deflocculated graphite is supplied mixed with a neutral oil, owing to its fine subdivisions which as stated, approach the molecular. Mr. Smith claims that it is held in colloidal suspension even though the carrying medium has a less specific gravity.

Considerable interest was caused by the statement that two particles of flake graphite have absolutely no attraction for one another and still the graphite subdivides in flakes of the same shape in the same manner that mica separates. The reason for these flakes binding together in a natural state is not known but there is a theory advanced that the binding material in the natural state is mica. Acid in the oil has a tendency to re-flocculate the deflocculated graphite.

Many New Members for S. A. E.

NEW YORK CITY, Dec. 22—The Society of Automobile Engineers has been active during the past few weeks and as a result important work has been done in the pleasure carwheels division of the standards committee and also in the line of new members.

The pleasure carwheels division, which met here during the past week, has progressed far enough to warrant the belief that

at the winter meeting of the society a definite set of standard dimensions for the demountable type of rim will have been agreed upon. In fact, the division at large is now through with the matter and it is merely necessary for the council, and the standards committee as a whole, to check over the report of the findings of the division and put them in their best possible form. This progress is giving the greatest amount of satisfaction both to the members of the division and to the manufacturers concerned who have worked hard to aid the committee. It looked for some time as if standardization were unobtainable in this particular field.

New applications have been pouring in lately and during 22 days in December the average exceeded three a day. There will be more than sixty-five to act upon at the next council meeting.

The society has decided to meet at the Automobile Club of America instead of at the Palace for its winter session. The dates will be as listed on page 1221.

Manhattan Club's Crusade for Motorists

NEW YORK CITY, Dec. 21—The Manhattan Automobile Club has started a crusade to protect the owner in his automobile investments. Another of its objects is the removal of the excessive annoyances which beset the automobilist in the streets, in garages not properly regulated, from irresponsible chauffeurs and from every other quarter. It will protect the public against the perils and annoyances of reckless automobiling, also get the right kind of legislation and prevent the wrong kind. In its crusade, the prompt regulation, by the automobilists themselves, in conjunction with the municipal authorities, of what has become in the eyes of the public a great problem, the automobile traffic in the streets of this city, will be included.

Now Motor Truck Club of America

NEW YORK CITY, Dec. 20—George G. Duck has been elected first president of the Motor Truck Club of America, formerly the Motor Truck Club. At the annual meeting at the Hotel Cumberland the following officers were elected: G. H. Duck, Locomobile Co., of America, president; E. W. Curtis, Jr., General Vehicle Co., first vice-president; A. I. Slade, consulting engineer, second vice-president; George Stevens, Adams Express Co., third vice-president; E. L. Howland, Journal of Commerce, secretary; M. R. Machol, Hydraulic Truck Sales Co., treasurer.

Automobile Trade Association of Washington Formed

WASHINGTON, D. C., Dec. 20—The Automobile Trade Association of Washington has been formed by a number of dealers who met this week and brought the organization into existence, with the following officers: president, J. M. Stoddard; secretary, R. H. Martin; treasurer, M. T. Pollock; board of control, Claude Miller, H. B. Leary, Jr., W. S. Keeler.

Moline Motor Shows Power Increase

**Knight Engine on Test at A. C. A.
Running for 2 Weeks at
1,100 R. P. M.**

NEW YORK CITY, Dec. 23—The Moline-Knight motor on test in this city at the Automobile Club of America, is running continuously at an average speed of 1,100 revolutions per minute and has shown an actual increase in power since the start of the test. According to unofficial bulletins issued every 5 hours the horsepower have increased from 38.2 at the beginning of the test to 38.7 at 8 o'clock this a. m. The lowest point reached was 38 and this was due to the fact that the windows were closed owing to rainy weather. When they were opened again an increase was noted as shown in the following table:

Horsepower Average	Horsepower Average
7-12 P.M., Dec. 19 38.2	11- 4 P.M. 38.1
12- 5 A.M., Dec. 20 38.2	4- 9 38.1
5-10 38.2	9- 2 A.M., *Dec. 22 38.0
10- 3 P.M. 38.1	2- 7 38.1
3- 8 38.1	7-12 38.2
8- 1 A.M., Dec. 21 38.2	12- 5 P.M. 38.3
1- 6 38.2	5-10 38.4
6-11 38.1	10- 3 A.M. 38.8
	3- 8 38.7

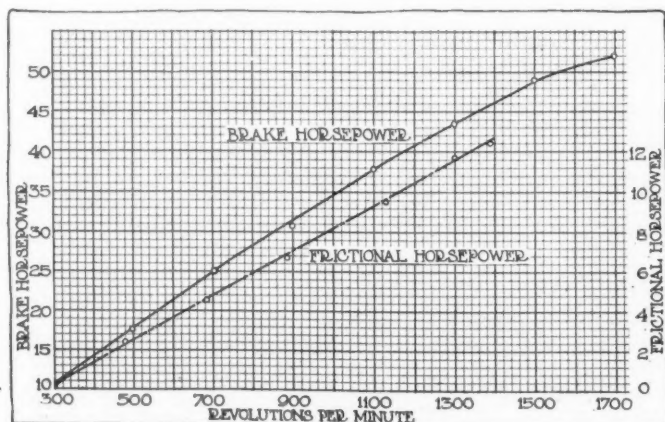
*Rainy, windows closed.

The average horsepower of the motor as shown by these figures which are averages for 5-hour periods show great regularity of power, with slight drops when the barometer goes down. The motor is the second Knight type built by the Moline people and was run very little before being put on test. It is fitted with a 1.5-inch Schebler carbureter, the throttle of which is kept wide open according to the test rules.

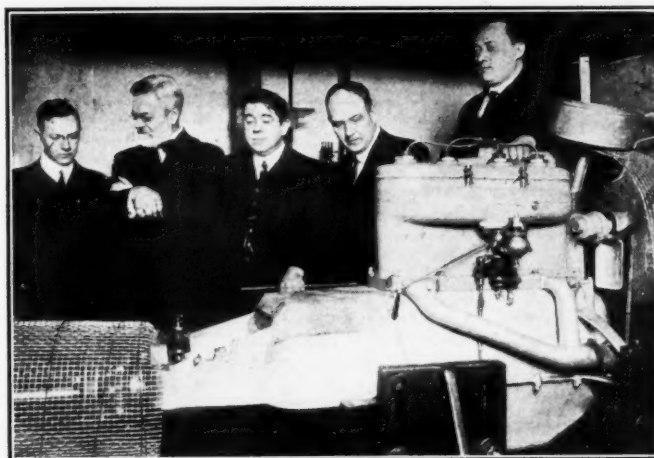
NEW YORK CITY, Dec. 19—At 7 o'clock this evening the 2-week test of the Moline Knight motor at the Automobile Club of America was put under way. During this test the motor will be operated at an average speed of 1,100 revolutions per minute and will be required to maintain a horsepower average nearly equaling the A. L. A. M. rating at that speed it being 28.8 horsepower and the A. L. A. M., 28.16 at that speed.

The motor which is to undergo what will probably be the longest duration test that has ever been held either in this country or in Europe, is a special Knight design which is remarkable in many ways. The four-cylinders are cast in block and have the intake and exhaust manifolds cast integrally with them. The result is a clean appearance, the smooth exterior being only broken by the carbureter, a Schebler model R, which is bolted directly to a flange on the intake manifold face. The dimensions of the motor are 4 by 6 inches and the A. L. A. M. rating 25.6. This is the first block Knight motor to be used in this country although it closely duplicates the designs which have recently been advanced in Europe.

Before the long test was started the motor was run for considerable time to make final adjustments in the carbureter setting.



Moline-Knight power curve with 1.5-inch carbureter set for flexibility



Messrs. Chase, Hutton, Knight, Van Dervoort and Thomas at Moline test

etc., and thence a maximum horsepower test at that setting was run off. In this test the motor did not develop as high a horsepower as it is capable of, owing to the fact that a 1.5-inch carbureter was used, whereas the maximum power is produced, according to the Moline and Knight engineers, by a 2-inch carbureter. The reason for using the 1.5 inch is that with this size the maximum flexibility is obtained and this is stock equipment on the car. The results of the test are given in the following table and also in the curve, Fig. 1.

R.P.M.	Torque Reading	Horse-power	Water In	Water Out	Spark Setting
300	35.2	10.5	79	133	Dead center
300	34.8	10.43	79	133	Dead center
500	35	17.5	79	147	16.6 per cent. advance
500	34.9	17.45	79	147	16.6 per cent. advance
700	35.7	24.9	85	160	33 per cent. advance
700	35.6	24.7	85	160	33 per cent. advance
900	34.2	30.75	85	157	50 per cent. advance
900	34.2	30.75	85	157	50 per cent. advance
1100	34.3	37.78	76	157	62.5 per cent. advance
1100	34.3	37.78	76	157	62.5 per cent. advance
1300	33.4	43.30	77	162	75 per cent. advance
1300	33.3	43.28	77	162	75 per cent. advance
1500	32.7	49.10	80	165	87.5 per cent. advance
1500	32.7	49.10	80	165	87.5 per cent. advance
1700	30.6	52.15	82	171	100 per cent. advance
1700	30.8	52.30	82	171	100 per cent. advance

A 15-minute run at 1,125 revolutions per minute was taken and the amount of oil wasted through the overflow during this time measured. This was found to be 106 cc., about a gill, and from this it was figured that the average oil consumption would probably be somewhere in the neighborhood of 1 quart an hour and that about 45 per cent. of this would be waste, owing to the system of having the oil drained off continually instead of making changes of the oil at stated intervals. The oil is being fed under a pressure of about 15 pounds and all the lubrication is taken care of by this force feed. There is no splash of the connecting-rods into the oil.

During the run the motor will be kept at a load which is about 1.3 times the A. L. A. M. rating at 1,100 revolutions per minute or about 36.6 horsepower. As the thermo-syphon system of cooling is used, the water is not positively forced to the cooling tank located above the motor in the laboratory and a small amount of cool water is allowed to flow into the supply to maintain a temperature which will probably be about 80 degrees Fahrenheit at the point of entering the cooling jacket and 160 degrees leaving. The spark setting will be about 62.5 per cent. advance, and this is not allowed to be changed during the run. The drive to the dynamometer is through two leather couplings.

Before the long run was started a frictional horsepower test was given during which the dynamometer acting as a motor drove the engine at different speeds. The frictional horsepower data obtained was as follows:

R.P.M.	Torque Reading	Horse-power	Water In	Water Out
480	5.0	2.4	76	136
490	5.0	2.45	76	136
690	6.6	4.55	76	134
690	6.6	4.55	76	134
890	7.5	6.7	76	132
890	7.5	6.7	76	132
1125	9.0	10.1	78	128
1130	8.9	10.1	78	128
1300	9.0	11.7	78	126
1240	9.0	11.15	78	126
1390	8.9	12.4	79	124
1380	8.8	12.15	79	124
1115	8.3	9.5	..	...
1120	8.3	9.5	..	...

N. Y. State License and Registrations Increase

Automobile Bureau Transacts 34 Per Cent. More Business

NEW YORK CITY, Dec. 20—According to figures tabulated by Mitchell May, secretary of state, the automobile bureau during the last 10 months has transacted 34 per cent. more business than was done in the corresponding period of 1912. The total net receipts from fees for licenses and registration certificates is \$1,275,000, as compared with \$1,060,000 in 1912 and \$905,000 in 1911, and there were registered during this year up to December 12, 133,000 owners, 57,000 chauffeurs and 1,800 dealers, as against 105,000 owners, 45,000 chauffeurs and 1,700 dealers in 1912. In 1911 there were 83,000 owners, 35,000 chauffeurs and 1,300 dealers.

The increased use of commercial cars is one of the most notable features, this type showing a gain of 61 per cent. over last year, when 8,500 were registered.

Approximately 50,000 cars of 25 horsepower or less were licensed as compared with 38,000 in 1912. There were 43,000 cars registered under 35 horsepower, against 34,000 in 1912, and 17,000 machines of less than 50 horsepower to 14,000 registered in 1912. A gain of only twenty cars is shown in the number of machines of 50 horsepower or more, increasing from 1,360 to 1,380.

In the county registration figures, New York still leads with approximately 23,000 pleasure and 6,000 commercial cars. Kings following with less than one-half of this number of pleasure cars and one-half of commercials. Erie county is next with nearly 9,000 pleasure and 1,200 commercial cars. Westchester has recorded 6,000 pleasure and 500 commercial machines.

Velie Company Files Statement

NEW YORK CITY, Dec. 22—The Velie Motor Vehicle Co., Moline, Ill., has issued a statement of its financial condition, dated August 31, 1913, which is compared as follows:

ASSETS		
	1913	1912
Real estate and plant.....	\$305,979	\$359,459
Machinery.....	75,269	.....
Material, stock in process.....	669,626	727,405
Cash and debts receivable.....	472,601	271,630
Fixtures, tools, etc.....	72,910	75,855
Deferred charges.....	54,520	48,755
Total.....	\$1,650,908	\$1,483,106
LIABILITIES		
Capital stock.....	\$800,000	\$501,000
Accounts payable.....	293,499	170,592
Funded debt.....	230,000	265,000
Floating debt.....	270,000	425,000
Profit and loss, deferred.....	43,366	.....
Surplus.....	14,042	121,014
Total.....	\$1,650,908	\$1,483,106

Gallagher Co. Buys Foundry

NEW YORK CITY, Dec. 22—Owing to the large increase in business, the Gallagher Carbureter Co., Inc., 1876 Broadway, has purchased the Edwards & Smith Co. Foundries, in Easton, Pa., and will operate under the name of the Lehigh Valley Foundries & Mfg. Co., with head offices in Easton, Pa. The company will manufacture Gallagher carbureters, strainers, J. M. shock-absorbers, special valves, including Standard Oil tank wagon faucets, Huyette steam specialties, Edwards' special valves, brass and aluminum castings of all kinds. The New York Service Department will continue at the same address, 1876 Broadway.

Taylor Mfg. Co. in Accessory Field

FITCHBURG, MASS., Dec. 20—The Major Taylor Mfg. Co. is the latest Massachusetts company to embark in the motor accessory industry and it will soon begin the manufacture of tires for motor trucks in Fitchburg, or possibly Worcester, Mass., shortly. The company is incorporated for \$1,000,000 and the officers are Fred I. Johnson, president; B. Austin Coates, vice-president; James W. Grady, treasurer; Elbert O. Leonard, secretary. The new company has bought the rights of the Major Taylor patents, which are designed to produce a tire without using any rubber. The tire is intended to do for motor trucks,

heavy apparatus, what the pneumatic tire does for pleasure cars, give a perfect resilient wheel and at the same time outlast the rubber tire. It is described as a shoe or section, containing four vanadium coil springs operating on a ball and socket in the shoe and so held in place and arranged as to take care of the shocks whether the truck is loaded or empty. Experiments have been made with a set and they have worked satisfactorily. Each section is so designed that 14 sections attached to a wheel make a complete tire. The mechanism is not delicate nor easily broken. When the plant gets going the output will be about 100 sets a day, with a yearly output of about 30,000. The cost will be about \$400 a set.

Van Patten to Handle the Saxon

NEW YORK CITY, Dec. 20—The Saxon car agency for this city has been taken over by L. A. Van Patten. Mr. Van Patten is at present connected with H. S. Houpt and sales manager of the latter's company and Lozier distributor in the East. He will retain his interest in the Houpt company.

Winding Co. Buys a Maxwell Plant.

CRANSTON, R. I., Dec. 20—The Universal Winding Co., of Providence, R. I., has bought the Auburn plant of the Maxwell-Briscoe Motor Co., Inc. The plant is located in the Auburn district of Cranston, a suburb of Providence. The property comprises about 12 acres, with twenty-one modern buildings.

While the Tarrytown, N. Y., and the Hartford, Conn., plants have not been sold as yet, there is every reason to believe that they will be disposed of in the very near future.

Disco Creditors' Meeting December 29

DETROIT, MICH., Dec. 20—The first creditors meeting of the bankrupt Disco company, will be held on the 29th of this month, at which time they can appoint a trustee and determine in what manner and at what time the property shall be sold.

Automobile Securities Quotations

No changes of any importance occurred in this week's automobile quotations.

	1912		1913	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com.....	180	200	195	220
Ajax-Grieb Rubber Co., pfd.....	96	100	99	102
Aluminum Castings, pfd.....	97	100	97	100
Chalmers Motor Company, com.....	..	..	89	93
Chalmers Motor Company, pfd.....	..	..	92	95
Consolidated Rubber Tire Co., com.....	13	14	40	41
Consolidated Rubber Tire Co., pfd.....	50	60	107	110
Firestone Tire & Rubber Co., com.....	310	320	240	250
Firestone Tire & Rubber Co., pfd.....	105	110	100	101
Garford Company, preferred.....	100	102	80	90
General Motors Company, com.....	34	36	37	37
General Motors Company, pfd.....	76 3/4	77 3/4	77	78
B. F. Goodrich Company, com.....	64	65	18	18 1/2
B. F. Goodrich Company, pfd.....	106	106 3/4	78	79
Goodyear Tire & Rubber Co., com.....	412	420	180	190
Goodyear Tire & Rubber Co., pfd.....	105 1/2	106 1/2	88 1/4	90
Gray & Davis Co., preferred.....	..	..	94	101
Hayes Manufacturing Company.....	..	90	..	..
International Motor Co., com.....	10	20	..	..
International Motor Co., pfd.....	40	60	..	15
Kelly-Springfield Motor Truck Co., com.....	..	..	40	60
Kelly-Springfield Motor Truck Co., pfd.....	..	..	90	105
Lozier Motor Company, com.....	..	..	..	16
Lozier Motor Company, pfd.....	..	..	..	90
Maxwell Motor Co., common.....	..	..	3	3 1/2
Maxwell Motor Co., 1st pfd.....	..	..	19	20
Maxwell Motor Co., 2nd pfd.....	..	..	7	7 1/2
Miller Rubber Company.....	160	170	115	120
New Departure Mfg. Co., com.....	..	..	..	145
New Departure Mfg. Co., pfd.....	..	..	101	102
Packard Motor Company, pfd.....	104	106	..	95
Palmer & Singer, pfd.....	..	..	..	65
Peerless Motor Company, com.....	..	..	15	25
Peerless Motor Company, pfd.....	..	..	75	80
Pope Manufacturing Company, com.....	30	33	1	3
Pope Manufacturing Company, pfd.....	71	74	7	12
Portage Rubber Co., com.....	..	..	..	40
Portage Rubber Co., pfd.....	..	..	..	90
Reo Motor Truck Company.....	9	10	5 1/4	7
Reo Motor Car Company.....	20	21	13 3/4	14 3/4
Rubber Goods Mfg Co., pfd.....	104	108	103	112
Russell Motor Car Co., com.....	..	..	..	40
Russell Motor Car Co., pfd.....	..	..	..	70
Splitdorf Electric Co., pfd.....	..	..	40	45
Stewart-Warner Speedometer Co., com.....	..	..	55	57
Stewart-Warner Speedometer Co., pfd.....	..	..	95	97 1/2
Studebaker Company, com.....	36	37 1/2	16 1/4	17 1/4
Studebaker Company, pfd.....	90	93	66	68
Swinehart Tire Company.....	100	105	65	70
U. S. Rubber Co., common.....	..	..	56	56 1/2
U. S. Rubber Co., 1st pfd.....	..	..	100	101
Vacuum Oil Co.....	..	..	189	192
White Company, preferred.....	104	107	105	110
Willys-Overland Co., com.....	70	71	58	61
Willys-Overland Co., pfd.....	100	101	82	89

Brazil Sales Should Be Greatly Increased

French Firms Gaining on American In Passenger and Commercial Cars

PARA, BRAZIL—I would be glad to see something done in this city that would tend to sell more of our automobiles. For a number of years we led the list as best sellers but due to the reluctance and refusal of our manufacturers to make changes or do anything that would oblige the trade we have dropped to the place of also ran. At the present time this business is in the hands of the Belgians, French, Germans and English and as things are going at present America will soon not have even a car on the market. General business at present is very bad, but notwithstanding this our foreign cousins seem to be able to sell cars and not cheap ones either. Just at present the Minervas seem to be the favorite, but the French Peugeots hold their own. Napiers for taxicab work are preferred, although some Panhards are imported and sold. In trucks we have but one example working, the rest of those used being French.

Michelin tires have a monopoly of the market, about 99 per cent. of the tires used being of this mark. I do not know that the condition is singular, but here it is a fact that the higher the price of the machine, the less consideration the local public give to American machines. Being interested to know the reason for this, as I know that there is no particular prejudice to things American, I put the question to a local dealer and agent for one of the big makes of foreign houses, also one that has consistently been a buyer of American goods in other lines. His argument was that we were good manufacturers on a large scale and in cheap lines but when it came to goods that required really fine work, really high-grade work, we were not able to produce it or as he concluded his remarks: "You make 50,000 or more machines with 5,000 men; whereas, the European manufacturer perhaps makes 3,000 machines with 2,000 men and consequently you cannot give your machines the care and attention nor make them so good," etc., etc., etc. Of course I know that this is all talk which displays considerable ignorance but the facts are that go where you will in South America you will find this the dominant note and it accounts for why we have not captured this market.

Every piece of advertising put out conveys this idea to the buyer and finishes up with the further remark that cash must accompany orders, two things that might with advantage be left to the imagination of the buyer. There is another point that should be considered and that is the necessity of our manufacturers establishing their own garages or repair plants. If we had had something of that kind in this place I feel sure that our success would have continued for a longer period.—American.

Krupps to Build Diesel Engines Here

NEW YORK CITY, Dec. 22—J. R. Dos Passos, general manager of the American Krupp-Diesel Engine Co., which will build engines of the oil-burning type, arrived recently after a conference with the Krupp directors in Kiel. He states that the Diesel motors will be built in this country. This company has already equipped three oil fuel engines for the Standard Oil Co.

U. S. Motor's Annual Meeting February 20

NEW YORK CITY, Dec. 23—Owing to the lack of a quorum, the postponed annual meeting of the old U. S. Motor Co., whose corporate shell still exists, was again adjourned. The next session is scheduled for February 20 at 2 o'clock.

Advance Gear Co. Organized

DETROIT, MICH., Dec. 27—A new company is being organized to manufacture a new and improved steering gear. The company is called the Advance Gear Co. Its location will be in Detroit. Mr. J. P. LaVigne, who was formerly chief engineer of the LaVigne Gear Co., has brought out this new and improved steering gear.

This gear is constructed on the push and pull principle, wherein the trunnion shaft is rotated by means of right and left threaded nuts or sliding heads. With this construction, the slid-

ing head on one side pushes downward while the other pulls upward. As the force exerted on one side is equalized by that on the other, there is no tendency to end motion and therefore no necessity for thrust bearings of any kind.

All parts subject to heavy strain are designed with a large factor of safety, made of steel throughout and are hardened, ground and lapped at all bearing points.

Pope Inventory Totals \$2,034,899

HARTFORD, CONN., Dec. 19—Inventory of the property of the Pope Mfg. Co. of this city within the state of Connecticut has been made to the superior court by John R. Hills and Frederick C. Billings, appraisers. The report has been filed in the superior court by Colonel George Pope, sole receiver in the state of Connecticut. The total including account receivable of \$181,461.30 amounts to \$2,034,899. The schedule is as follows:

Land on Capitol avenue.....	\$84,750.00
Buildings on this property.....	634,375.00
West Works lot.....	47,200.00
Buildings on this property.....	62,800.00
Equipment at main plant.....	107,000.00
Machinery for manufacturing.....	369,877.71
Standard small tools.....	15,000.00
Special tools.....	46,822.00
Patterns for auto parts.....	2,600.00
Main office furniture, etc.....	3,500.00
Equipment at West Works.....	14,875.58
Machinery, tools, etc.....	11,795.56
55 second-hand cars.....	40,000.00
43 cars in process.....	81,300.00
Raw material, finished parts, etc.....	331,542.81
Collectible accounts.....	181,461.30
Total.....	\$2,034,899.96

The appraisers did not make their inventory at cost prices, but upon their own judgment. Regarding the west works the appraisers say they would cost about \$200,000, but they inventory them at \$62,800. As this property is not well adapted to general manufacturing purposes and was on the market for a long time before being sold for \$75,000 and \$35,000 had been expended for repairs and rebuilding, making a total of \$110,000, the appraisers think that this is all the land and buildings should be valued at the present time. Inventory of raw material, finished parts, work in progress and supplies taken at actual cost amounts to \$663,085.63, but the appraisers value them at \$331,542.81. Regarding debts owed the company the appraisers say there are 797 accounts receivable amounting to \$224,519.18 some of them are very old and doubtful and after considering those not collectible the appraisers reduce the amount to \$181,461.30. The appraisers also state that they have based their inventory upon cost of replacement and value to plant and conduct of business as a going concern, less depreciation.

NEW YORK CITY, Dec. 20—The new New York branch of the Pennsylvania Rubber Co., 1889 Broadway, has been opened. The branch occupies 6,000 square feet.

Market Changes of the Week

Most all of the market prices remained the same as last week's reports. Copper, cottonseed oil and tin had their usual changes. Electrolytic copper dropped \$0.00 1-20 per pound while Lake copper dropped \$0.00 1-8. Tin dropped \$0.52 per 100 pounds. The drop in the London market on Monday was a disappointment to local operators, who had anticipated a sharp advance. On Monday there were freer offerings of all positions at concessions and very little demand from consumers. Lead is steady but dull.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Change
Antimony, lb.....	.06	.06	.06	.06	.06	.....
Beams & Channels, 100 lbs.....	1.36½	1.36½	1.31½	1.36½	1.36½	.....
Bessemer Steel, ton.....	20.00	20.00	20.00	20.00	20.00	.....
Copper, Elec., lb.....	.14½	.14½	.14½	.14½	.14½	—00 1/20
Copper, Lake, lb.....	.14½	.14½	.14½	.14½	.14½	—00 1/8
Cottonseed Oil, bbl.....	6.70	6.70	6.77	6.70	6.60	—10
Cyanide Potash, lb.....	.17	.17	.17	.17	.17	.....
Fish Oil, Menhaden, Brown.....	.39	.39	.39	.39	.39	.....
Gasoline, Auto, 200 gals... ..	.22¼	.22¼	.22¼	.22¼	.22¼	.....
Lard Oil, prime.....	.92	.92	.92	.92	.92	.....
Lead, 100 lbs.....	4.00	4.00	4.00	4.00	4.00	.....
Linseed Oil.....	.52	.52	.52	.52	.52	.....
Open-Hearth Steel, ton.....	20.00	20.00	20.00	20.00	20.00	.....
Petroleum, bbl., Kansas, crude.....	1.03	1.03	1.03	1.03	1.03	.....
Petroleum, bbl., Pa., crude.....	2.50	2.50	2.50	2.50	2.50	.....
Rapeseed Oil, refined... ..	.62	.62	.62	.62	.62	.....
Rubber, Fine Up-river, Para.....	.73	.73	.73	.73	.73	.....
Silk, raw Italy.....	4.95	.....	.....	.....	4.95	.....
Silk, raw Japan.....	3.95	.....	.....	.....	3.95	.....
Sulphuric Acid, 60 Baume.....	.90	.90	.90	.90	.90	.....
Tin, 100 lbs.....	37.13	37.10	37.10	37.00	36.88	—52
Tire Scrap.....	.05	.05	.05	.05	.05	.....

Detroit's Service Bureau

Manufacturers Organize to Secure Co-operation in Making Outside Purchases of Material and Automobile Parts

DETROIT, MICH., Dec. 20—Striking evidence is given Detroit's prominence as a manufacturing center by the inauguration of the Manufacturers' Service Bureau. The pioneer in this field is J. C. Austin, former assistant chief engineer of the Studebaker Corp. who has resigned that position and established offices at 528 Ford Bldg.

Mr. Austin's bureau is representing both automobile and automobile parts manufacturers by providing means for co-operation. Many Detroit firms purchase parts outside the city; many outside manufacturers buy parts here. A considerable amount of skilled adaptation is often necessary. In the past this has sometimes resulted in delay and personal attention from non-resident engineers. In such cases, Mr. Austin will represent both parties in expediting co-operation between them.

Buying P. O. Trucks New Departure

WASHINGTON, D. C., Dec. 20—The annual report of J. A. Edgerton, purchasing agent of the post office department, made today to the postmaster general sets forth the fact that the purchase of motor cars for the postal service is a new departure. "Heretofore all vehicles have been rented under contract," says Edgerton. "On January 20, 1913, my predecessor issued an advertisement for motor vehicles and on March 3 an award was made to thirteen contractors for an aggregate of 100 machines. This award was afterwards declared invalid by the controller on the ground that on the date mentioned there was no appropriation available out of which such purchases could be made. Subsequently a special committee was appointed to investigate and standardize vehicles for the service, being directed among its other duties to inquire into the relative cost of purchase and rental of motor cars. This committee reported favorably on the purchase of 41 machines, 20 being of the four-wheeled and 21 of the three-wheeled type. Such purchase was subsequently made. The investigation is still in progress.

"All of the four-wheeled machines are now in the service and while reports have been necessarily meager the indications thus far are that a marked saving will be shown as compared with cars under rental. This is especially true of motor cars employed in parcel post delivery."

R-C-H Corp. Brings \$295,000

DETROIT, MICH., Dec. 20—The R-C-H Corp. was finally sold to the Todd-Frank-Friedberg Co., Ltd., at the hearing before Referee in Bankruptcy, Lee Joslyn, here today. The purchase price is \$295,000 for real estate and all other property. The contract stipulates that this amount must be realized, net, the bid accepted being of the guarantee form, whereby the buyer must remit to the creditors all moneys realized after deducting the commission.

There has been considerable delay to this sale, due to the opposition of several of the creditors who have claimed that a higher figure could be secured for the assets. They failed to prove their claims today to the satisfaction of the bankruptcy court, hence the deal was closed.

Standard Welding Takes Up Wire Wheels

CLEVELAND, O., Dec. 20—The Standard Welding Co. has taken up the wire wheel and is already in a position to supply them complete of its own manufacture. It has entered the field with Ford car sets, costing \$25 retail. Other types of wheels are being developed, however, embodying advanced features.

Grant Begins Active Operations

FINDLAY, O., Dec. 22—The Grant Motor Company, which a few weeks ago took over the defunct Findlay Motor Works, has already begun operations and expect to turn out probably fifty cars during this month. January will see the output increased to 200, while in February it will be 500 and then the capacity of the plant, which will be made about 700 monthly. It is said that the new company, which is composed of Detroit men exclusively, have contracts for 5,000 cars. Agents have been established in four foreign countries, and more than 500

in America. The car is called the Grant, four-cylinder, four cycle, 21 horsepower, and has attained a speed of 55 miles an hour. Its guarantee is 30 miles on a gallon of gasoline. Its wheel base is 90 inches with 28 by 3 English type wire wheels.

The officers of the company are: President, George D. Grant, of Detroit; secretary and treasurer, Charles A. Grant, of Detroit. Herman J. Koehler, of New York, David A. Shaw, George S. Wait, George S. Salzman, and James L. Howe, all of Detroit, are also interested in the company.

Adamson Manufacturing Co. Wins Vulcanizer Suit

MILWAUKEE, WIS., Dec. 22—The Adamson Mfg. Co. has been granted a permanent injunction against the C. A. Shaler Co., of Waupun, Wis., the decree being in a suit brought under the Adamson patent No. 1,057,911. This is a patent for a portable vulcanizing device for tires.

Cars Being Sold Without License

RALEIGH, N. C., Dec. 20—Automobile dealers in this city are raising a protest over the action of the State and county authorities in allowing outside dealers to come to Raleigh and sell their machines without license to do business in the State. It is charged that these outsiders are openly violating the laws of North Carolina, and that they are selling machines in the city without even having state license to sell their particular machine in North Carolina.

In answer to the position of the State authorities, the Raleigh dealers state that the law is not enforced for the reason that it is not constitutional and that the State treasurer fears that if these no-license dealers are forced to pay this tax, a test case will go to the Supreme Court, and there it will be declared invalid, whereupon the treasurer would have to refund all of the licenses that have already been paid in by the dealers complying with the law as it now stands.

U. S. Tire Answers De Laksie and Thropp

NEW YORK CITY, Dec. 23—The U. S. Tire Co. has filed an answer to the complaint of the De Laksie & Thropp Circular Woven Tire Co., and the John E. Thropp's Sons Co., in the U. S. District Court for the Southern District of New York.

In its answer it admits that the Letters Pat. 822,561, was issued to P. D. Thropp for certain alleged improvements on apparatus for manufacturing wheel tires, but claims that Thropp was not the original inventor, citing one French inventor and ten U. S. men.

It also denies that it now owns or has ever owned any of the capital stock of the Hartford Rubber Works Co., or the Morgan & Wright Co., and also ever having any interest in either of them.

It also states that it has never manufactured tire molds for manufacturing tires, or ever manufacturing automobile tires. Its only connections with the above-named companies were only in the way of a customer.

The patent itself is claimed to be invalid, because it has been adjudicated in the U. S. Circuit Court of Appeals for the First Circuit in Boston, Mass., by a decision of that court in equity between the complainant and the Fisk Rubber Co. This decision said that the patent was invalid because of prior use.

Two More Canfield Licensees

NEW YORK CITY, Dec. 20—The Splitdorf Electrical Co., Newark, N. J., and the Standard Co., Torrington, Conn., have been added to the list of the licensees under the Canfield patent. This makes the total number of licensees under the patent owned by A. R. Mosler & Co. amount to twenty-one.

New Firm in Oil Field

NEW YORK CITY, Dec. 22—A new and strong factor in the automobile oil field will be the Platt & Washburn Oil Co., which was incorporated in 1885. This company has been working to develop a line of motor lubricants refined from the best Pennsylvania crude oil. These oils may be seen at the local automobile show, January 3, at the Grand Central Palace.

Record List of Exhibitors for Importers' Salon

NEW YORK CITY, Dec. 22—The largest number of exhibitors which have ever participated in a foreign automobile show in this country, have just been announced for the Importers' Automobile Salon, which opens in the Grand Ball Room of the Hotel Astor on January 2, for an 8-day run. The list includes thirteen different makes of cars, two body builders, five makes of tires and two other accessory exhibitors. Altogether seven different nations are represented.

The various makes of foreign cars which will be shown at the Salon are, in alphabetical order, as follows: Benz, Bugatti, De Dion, Bouton, Delauney-Belleville, Fiat, Isotta-Fraschini, Lancia, Marshall Arter, Mercedes, Minerva, Peugeot, S. G. V. and Simplex. The nations represented by these cars are France, Germany, Italy, Belgium, England and America. There is a possibility of Spain being also represented for the first time in this country, by a Hispano-Suiza, for which an agency is about to be established in New York.

The exhibits of foreign tires and accessories are a new feature for the Salon, but those importing them were able to prove their right to participate. The tire exhibits include Dunlop, Englebert, Faure, Gaulois and Prowodnik, the latter a Russian product. In addition, Dunlop wire wheels will be shown and A. J. Pickard will have a complete line of foreign automobile accessories.

Boston Chauffeur Wins Winton Prize

NEW YORK CITY, Dec. 18—J. L. Dondero, of Boston, Mass., won the \$1,000 prize, which is given by the Winton M. C. Co., Cleveland, O., each year, for driving 27,542 miles without repair expense to his employer, Thos. Murren, of Medford, Mass., was second with a prize of \$500 for driving his Winton 18,273 miles without repair expense to his employer. Each year the Winton company distributes \$3,500 in cash prizes to the twenty Winton chauffeurs who make the best records in high mileage and low repair expense. There were a few other prizes ranging from \$250 down to \$100.

Big Car Sales in Ontario

TORONTO, ONT., Dec. 22—The growth of the automobile business in Ontario during the past year does not suggest any stringency of money. The news from all sources for the year will aggregate approximately \$100,000 for the past 12 months, against \$73,255 for the previous year. The number of automobiles in the Province of Ontario is, in round numbers, 24,000 compared with 20,000 last year, and 1,176 in 1906. Increase in 1912 was practically 50 per cent. over the figures of 1911. In that year the fees from automobiles totaled \$50,831, compared with \$73,300 in 1912. In 1906 the receipts from motor licenses were \$5,523 compared with practically \$100,000 for the past 12 months.

The following table shows the great growth of the business, which is ten times larger than in 1906, the first year of any automobile importance in Ontario:

Year	Issued	Ontario
1906	1,176	517
1907	1,530	550
1908	1,754	589
1909	2,452	1,020
1910	4,230	1,977
1911	11,339	7,538
1912	20,985	13,627

For the past year there have been 24,000 automobile licenses issued, all owned in Ontario. Last year the automobiles owned in Ontario numbered 11,939, while 4,337 of the cars here were owned elsewhere. This year there were approximately 3,500 licenses issued to chauffeurs against 2,965 last year.

Fiat Brings Another I. F. Suit

NEW YORK CITY, Dec. 23—The Fiat company, Poughkeepsie, N. Y., has brought another suit in the U. S. District Court of the Southern District of New York, against the Isotta Fraschini Motors Co., this time involving patent No. 979,278, issued to Guido Fornaca, on December 20, 1910. This patent covers certain improvements in vehicle frame suspension. The plaintiff is praying for an injunction.

Reo Co. to Market Its Cars

DETROIT, MICH., Dec. 22—The Reo Motor Car Co., Lansing, Mich., will hereafter sell its motor vehicles direct to the trade instead of marketing its output through the R. M. Owen Co., as done heretofore. By this arrangement which has recently been consummated, the R. M. Owen Co. passes out of existence as an individual organization, the Reo company conserving the entire agency, however, with the exception of R. M. Owen, who retires to devote his attention to other interests. The sales work continues to be directed, as in the past, by R. C. Rueschaw, who will retain the efficient organization he has developed.

Booth Leaves Studebaker Corp.

DETROIT, MICH., Dec. 22—The Studebaker Corp., has announced the resignation of Clarence H. Booth, general manager of the Automobile Division of the corporation, to take effect on January 1, 1914. Mr. Booth was under contract for a term of years, but in order to carry out plans of his own has been released at his request.

Europe for Big Races

New Conditions Made Fixing the Contest Weights—Dates for Classics Announced

PARIS, Dec. 13—Races under the 4.5 liter 2746 cubic inches piston displacement rule will be a strong feature of the 1914 European racing season. This rule has been adopted by the Automobile Club of France for its Grand Prix at Lyons, next July. It has also met with the approval of the German, Belgian, and Italian automobile clubs, and races with motors of 4.5 liters cylinder capacity will be held in these respective countries during the year.

In the French event the only other important restriction is a maximum weight limit of 2,425 pounds empty. In the German race, which will doubtless be held during September 10 to 15, the conditions are 2746 cubic inches piston displacement, a maximum weight limit of 2,425 pounds, and a minimum weight of 1,763 pounds. In addition the racing cars will be limited in fuel supply to the rate of 20 liters per 100 kilometers, which is equivalent to 14.1 miles to the gallon. The distance to be covered will be about 450 miles. The Belgian conditions are exactly the same as those for the French Grand Prix. The Italian race will also be run under the French conditions. In addition to these international races, there undoubtedly will be a second edition of the French Grand Prix at Le Mans about the end of July. Under this arrangement manufacturers who are building 4.5 liter cars will have an opportunity of obtaining some recompense for their efforts, for they will be able to race those cars throughout the entire season. A further advantage of the new European racing rule is that a 274 cubic inches racing motor is not a monster and will find a very ready sale. The fact that some of the older cars were only sold with the greatest difficulty had its influence in preventing the smaller firms competing.

The French Grand Prix at Lyons, which will open the series on July 4, will probably have thirty starters. These will comprise Peugeot, with Boillot, Jules Goux and Victor Rigal as the drivers; Sunbeam, Delage, Fiat, Aquila-Italiana, Opel, Mercedes, Cottin-Desgouttes, Alda, and Hispano-Suiza as the leading competitors. Only one entry has yet been made, but practically all these firms have advanced their 1914 racing machines beyond the drawing board stage. The first of the Peugeot racers is now being erected and will be on the road in January.

The second French race, near Le Mans, is provisionally fixed for the end of July. The conditions are the same as at Lyons, but the course being practically dead level higher speeds should be attained than at the official club race. The Belgian race will be a 2-day event, the opening day being for small machines on a speed and regularity basis, and the second day for 274 cubic inches racing cars on a speed basis only. The course will doubtless be a fast one in the Belgian Ardennes.

Italy has fixed its race meeting for September 6 and 7, the course being a 20-mile triangle near the town of Brescia. The roads are dead level passing through but two small villages. Races were held on this course in 1904, 1905 and 1907. The second day of the meeting will be given up to an aeroplane race above the automobile course. Germany's provisional date clashes with that of the Italian club, but an arrangement will doubtless be arrived at. The race will be held in Mecklenburg duchy, within easy distance of Berlin and will be run over a 25-mile course for a distance of about 450 miles.

To Have Brooklyn Night at Show

NEW YORK CITY, Dec. 22—Inasmuch as there will be no automobile show staged in Brooklyn this season, the Automobile Chamber of Commerce, under whose auspices the fourteenth National Automobile Show in Grand Central Palace, New York City, is to be held, has set aside a night to be known as Brooklyn Night. Tuesday, January 6, is the day selected. The members of the Brooklyn Motor Vehicle Dealers' Association, Long Island Automobile Club members, and certain other prominent civic organizations and individuals from the City of Churches will be invited.

DETROIT, MICH., Dec. 22—The regular quarterly dividends of 1.75 per cent. on the preferred stock and 2.5 per cent. on the common stock have been declared payable January 2, 1914, to stockholders of the Chalmers Motor Co.

Factory Miscellany

STEVENS-DURYEA Plant Strains Air—The Stevens-Duryea Co., Chicopee Falls, Mass., has a new department in its body work. To put a finish on its bodies that will remain flawless for years it has equipped a drying room in which the ventilation is controlled mechanically. To get adequate ventilation and the removal of dust and foreign substances from the drying atmosphere of the room, the room is supplied with air by mechanical blowers. The windows are sealed tight, and the air is changed continuously, being drawn into the room through a series of screens made up of cheesecloth. The destructive gas is pumped out of one set of flues before it has time to form a chemical union with the pigments of the finish, and thus cause spotting on the surface.

Auto Tractor Will Build—The Auto Tractor Co., recently organized in Niles, Mich., is planning to erect a one-story, 90 by 250-foot factory there.

Moore Truck Will Move—The Moore Motor Truck Co., Philadelphia, Pa., will remove its plant to Wilmington, Del., and installation of machinery will begin this week.

New Body Factory—The American Body Co., Buffalo, N. Y., manufacturer of automobile bodies and equipment, is

building an addition to its plant at Niagara street and Auburn avenue.

Maccar Plant Being Altered—Alterations are being made to the plant of the Maccar company of Allentown, Pa. About 100 hands will be employed at the opening of the plant around December 20.

Golden West Plant Progressing—The Golden West Motors Co., Sacramento, Cal., manufacturer of motor trucks, has completed the first unit of its plant, a building 30 by 100 feet, and started work on a second, 100 by 200 feet.

S. & M. Tire Plant Nearing Completion—The plant of the S. & M. Tire & Rubber Co., of Coshocton, O., is nearing completion and machinery is being installed. It is expected to have the plant in operation by the first of the year.

John Brown Plant Completed—The new plant of the John W. Brown Mfg. Co., located on Marion Road, Columbus, O., has been completed and machinery is now being installed. The plant manufactures lamps for the Ford company exclusively.

Lion Liner Moves Factory—The Lion Liner Co. of Appleton, Wis., manufacturing inner-liners and other tire specialties, has moved its factory and general

offices to Sheboygan, where the floor space is more than doubled. W. L. Steward is general manager.

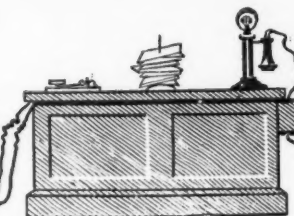
Charleston May Have Plant—That Charleston, Mo., may have an automobile factory, employing 300 men and manufacturing 2,000 machines next year, is the proposition made by the Warren Electric & Machine Co., Indianapolis, Ind. E. P. Warren, who is secretary of the Indianapolis concern, of which the new plant would be a subsidiary, is in charge of the matter of choosing a location for this industry. He states that a \$100,000 company is being organized to manufacture cyclecars and it expects to begin manufacturing them not later than January 1.

Fisk Will Build Warehouse—The Fisk Rubber Co., Kansas City, Mo., has completed arrangements by which a four or a six-story reinforced concrete sales and warehouse building to represent an investment of \$125,000 will be built at once on the southwest corner of Twentieth street and Grand avenue as the local factory branch of the company. The branch was established here 8 years ago and at present is located in a two-story building at 1604 Grand Avenue. The building will be ready for occupancy not later than July 1. The local manager is Richard Belt.

The Automobile Calendar—Shows, Meetings, Etc.

Jan. 2-10.....New York City, Importers' Automobile Show, Hotel Astor.	Jan. 24-31.....Montreal, Que., Automobile Show, Passenger Cars, Montreal Automobile Trade Assn.	Feb. 14-21.....Pittsburgh, Pa., Automobile Show, Pittsburgh Auto Show Assn.
Jan. 3-10.....New York City, Automobile Show, Grand Central Palace.	Jan. 24-31.....Rochester, N. Y., Automobile Show, Exposition Park, Rochester Automobile Dealers' Assn.	Feb. 16-21.....Kansas City, Mo., Auto Show.
Jan. 4-8.....New York City, Meeting S. A. E.	Jan. 24-31.....Chicago, Ill., Automobile Show, Coliseum and First Regiment Armory.	Feb. 18-21.....Bloomington, Ill., Automobile Show, McLean County Automobile Club.
Jan. 5-10.....Los Angeles, Cal., Automobile Show, Grand Avenue Pavilion.	Jan. 26-31, 1914...Scranton, Pa., Automobile Show, Automobile Assn. of Scranton.	Feb. 21.....Santa Monica, Cal., Vanderbilt Cup Race.
Jan. 10-16.....Milwaukee, Wis., Sixth Annual Show, Auditorium, Milwaukee Automobile Dealers' Assn.	Jan. 31-Feb. 7....Minneapolis, Minn., Automobile Show.	Feb. 21-28.....Newark, N. J., Automobile Show, N. J. Auto Trade Assn.
Jan. 10-17.....Cleveland, O., Automobile Show, Wigmore Coliseum, Cleveland Automobile Show Co.	Feb. ....Hartford, Conn., Show.	Feb. 21-28.....Cincinnati, O., Automobile Show, Cincinnati Automobile Dealers' Assn.
Jan. 10-17.....Philadelphia, Pa., Show Metropolitan Building, Automobile Trade Assn., H. W. Terry, Secretary.	Feb. 2-7.....St. Louis, Mo., Show.	Feb. 23.....Santa Monica, Cal., American Grand Prix.
Jan. 10-21.....Brussels, Belgium, Salon de l'Automobile du Cycle et des Sports; Chambre Syndicale de l'Automobile et du Cycle de Belgique.	Feb. 2-7.....Buffalo, N. Y., Automobile Show, Buffalo Automobile Dealers' Assn.	Feb. 23-28.....Omaha, Neb., Automobile Show, Omaha Automobile Assn.
Jan. 12-17.....Bridgeport, Conn., Annual Automobile Show, State Armory, B. B. Steiber, manager.	Feb. 3-7.....Kalamazoo, Mich., Show.	Feb. 24-28.....Syracuse, N. Y., Automobile Show, State Armory, Syracuse Automobile Dealers' Assn.
Jan. 14-21.....St. John, N. B., Maritime Automobile Show, New Brunswick Automobile Assn.	Feb. 3-7.....Montreal, Que., Motor Truck Show, Montreal Automobile Trade Assn.	Mar. 2-4.....Cincinnati, O., Commercial Vehicle Show, Cincinnati Automobile Dealers' Assn.
Jan. 17-24.....Detroit, Mich., Automobile Show.	Feb. 4-7.....St. Joseph, Mo., Annual Show, St. Joseph Auditorium, St. Joseph Automobile Show Assn.	Mar. 2-6.....Fort Dodge, Ia., Show, Fort Dodge Auto Dealers' Assn.
Jan. 17-24.....Pittsburgh, Pa., Annual Automobile Show, Automobile Dealers' Assn.	Feb. 7-12.....Seattle, Wash., Annual Automobile Show, State Armory Bldg., W. I. Fitzgerald, Manager.	Mar. 7-14.....Hamilton, Ont., Passenger and Truck Show.
Jan. 19-24.....Washington, D. C., Automobile Show, Convention Hall, Washington Automobile Dealers' Assn.	Feb. 9-14.....Buffalo, N. Y., Truck Show, Buffalo Automobile Dealers' Assn.	Mar. 7-14.....Boston, Mass., Automobile Show.
	Feb. 9-14.....Buffalo, N. Y., Commercial Car Show, Buffalo Automobile Dealers' Assn.	Mar. 9-14.....Des Moines, Ia., Show, Des Moines Automobile Dealers' Assn.
	Feb. 9-14.....Grand Rapids, Mich., Fifth Annual Western Michigan Show, Klingman Furniture Exposition Bldg., Grand Rapids Herald.	Mar. 17-21.....Boston, Mass., Truck Show.
		Apr. 9-15.....Manchester, N. H., Automobile Show.
		May 30.....Indianapolis, Ind., 500-mile Race, Indianapolis Motor Speedway.
		July 4.....Lyons, France, French Grand Prix.
		July 25-26.....Belgium Grand Prix Road Races.

The Week in the Industry



Motor Men in New Roles

POWER Chicago Electric Manager—J. R. Power, who has had charge of the wholesale business of the Anderson Electric Car Co., has taken up the position of district manager for the Chicago Electric M. C. Co., Chicago, Ill. His territory will include Illinois, Indiana and Wisconsin, with headquarters in Chicago.

Leckler Grossman Superintendent—H. H. Leckler has been made superintendent of the Emil Grossman Mfg. Co.'s Brooklyn, N. Y., plant. He still holds the position of mechanical engineer.

New Manager for Boston Branch—M. E. Brackett has been appointed manager of the Boston, Mass., branch of the General Motors Truck Co., to take the place of J. L. Morris, who resigned.

Chase with Lyons-Atlas—Edwin H. Chase, Jr., formerly manager of Cole sales for the Standard Auto Co., is the new assistant sales manager of the Lyons-Atlas Co., of Indianapolis, Ind.

Dorsett New Manager—L. P. Dorsett has succeeded John McDonald, Jr., as manager of the McDonald M. C. Co., 239 Wisconsin street, Milwaukee, Wis., distributor of the Lozier car. C. G. Pauli is president of the company.

McCanna Dies in New York—C. B. McCanna, president of the Burlington, Wis., Brass Works, died suddenly in New York, where he was attending the convention of American brass manufacturers. He was a prominent financier and manufacturer.

Oswald with Sherwin Williams—H. A. Oswald, former superintendent of painting, trimming and enameling for the Flanders Mfg. Co., and the Hudson M. C. Co., is now connected with the Sherwin Williams Co., as special representative, Cleveland, O.

Brady Gets a Patent—James W. Brady, of Springfield, Mass., has been granted patents on a resilient hub for use principally on motor vehicles designed to take up the shock, and so do away with the pneumatic tires, by substituting solid tires in connection with his device.

Casebeer Succeeds Maroney—F. H. Casebeer, formerly manager of the Oklahoma City, Okla., branch of the Good-year Co., has been named to succeed J. A. Maroney in St. Louis, Mo., who was recently promoted to manager of the carriage-tire department of that firm at Akron, O. M. H. Parsons remains as district manager with headquarters in St. Louis.

Caton Resigns from Firm—The firm of Caton & Brewster, agents for Velie and Pope-Hartford lines at Worcester, Mass., has been reorganized and Eugene L. Caton has sold out his interest. Charles L. Brewster will conduct the business alone. Mr. Brewster will move to 75 Central street, where he will have larger quarters, and he has placed Sam-

uel McFayden in charge of the service department.

Hupp's Connection Only Temporary—Through the temporary connection of L. G. Hupp with the Briggs-Detroit Co., Detroit, Mich., the report that it was permanent is erroneous. C. S. Briggs, president of the Briggs-Detroit Co., states that Mr. Hupp's work was only undertaken to relieve his own labors and that it was not and has not been the intention of the manufacturer to discontinue his plans to manufacture the Tribune car.

Garage and Dealers' Field

Paige and Chandler Moves—The agencies of the Paige-Detroit and Chandler cars in Boston, Mass., has moved from Ipswich street to 1118 Boylston street.

Takes On A. V. Absorber—The John V. Wilson Co., Boston, Mass., has taken on the agency for the A. V. shock absorber, made abroad, and will market it in the New England territory.

Lorimer Makes a Move—L. B. Lorimer, agent for the Hudson cars in Rhode Island, has moved into a new salesroom and service station at 89-91 Plenty street, Providence, R. I.

Takes Hess-Bright Agency—The Fisher Automobile Co., Indianapolis, Ind., has taken the agency for Hess-Bright ball bearings and will also handle all of the renewal business in Indiana.

Kemco Generator in Milwaukee—The Kemco fan type electric generator will be distributed in the Wisconsin territory by the Kemco Electric Sales Co., which has established offices and salesrooms at 454 Jackson street, Milwaukee.

Whitten Has New Place—William W. Whitten, who has the Krit, Marathon, Abbott-Detroit and Herreshoff in Rhode Island, moved into new quarters at 148 Washington street, Providence, where he has much more room.

F. S. Carr Co. Moves—The F. S. Carr Co., Boston, Mass., manufacturer of waterproof automobiles and carriage fabrics, has moved into the Francis Building, 31 Beach street, that city. The general offices will be situated there.

Michelin Tire in Seattle—The Tire Service House is a new addition to Seattle's automobile row. The firm will distribute Michelin tires in western Washington. H. C. Stevenson and A. E. LeBallister are operating the concern.

Milwaukee's First Cyclecar Garage—The Cyclecar Sales Co., Milwaukee, Wis., representing the Imp cyclecar, has opened a garage and salesroom in the Chacona Building, 803 Grand avenue. This is the first cyclecar garage in Milwaukee.

M-B-M Motor Co. Moves—The M-B-M Motor Co., Boston, Mass., has

moved from Boylston street to 41 Munroe street, Cambridge, where it has a salesroom and service station under the one roof, handling the Wagenhals delivery car.

Apperson Factory Branch Established—The Apperson Bros. Automobile Co., Kokomo, Ind., has established a direct factory branch in Seattle, Wash., with D. C. Guichard in charge as manager. Quarters have been taken at 907 East Pike street.

Will Manufacture Automobile Specialties—C. S. Goby, formerly chief engineer of the Goby Engineering Co., and J. L. Schwartzburg have organized the Motor Engineering Co., 1686 West Third street, Cleveland, O., to manufacture automobile specialties.

Wing Leases New Building—F. E. Wing, New England distributor of the Marmon cars, has just leased the big building erected recently for the Lozier Co. on Commonwealth avenue and Beacon street, Boston, Mass., and he will move there from the motor mart in Park square in the near future.

New Building Ready—The new building being erected for the Packard M. C. Co., of Springfield, Mass., is practically finished, and the company will move into it on January 1. It is 100 feet by 60, giving 6,000 square feet of floor space. It is a one-story structure and is located in the rear of the present plant on State street.

St. Louis Diamond-Goodrich Combine—With the completion of the new building at Garrison and Locust streets, St. Louis, Mo., the B. F. Goodrich Rubber Co. and the Goodrich and the Goodrich and Diamond stores in that city will be combined, as was the case in nearly all other cities. L. K. Rittenhouse will manage the new store.

Pacific KisselKar Moves—The Pacific KisselKar Branch, San Francisco, Cal., has removed to its new quarters at Van Ness avenue and Geary street. The new home of the KisselKars, Federal trucks and Fords is one of the largest on the Pacific Coast. The space occupied by the company is approximately 50,000 square feet.

Calgary's Million-Dollar Building—The Hudson Bay Co. recently opened in Calgary, Alta., one of the finest general stores in the Northwest. The building which houses the store cost a million and a half dollars. The Hudson Bay Co. is one of the most powerful mercantile institutions ever organized. It has a history dating back to the time of King Charles II.

Klaxon Awards Prizes—The awards committee in the competition for the best suggestion as to the solution of the problem, The Automobile Warning Signal, Its Use and Regulation, has just awarded the prizes offered by the makers of the Klaxon horn. The first prize of \$150 was won by R. F. Day, Springfield, Mass. There were other prizes ranging from \$50 down to \$10.

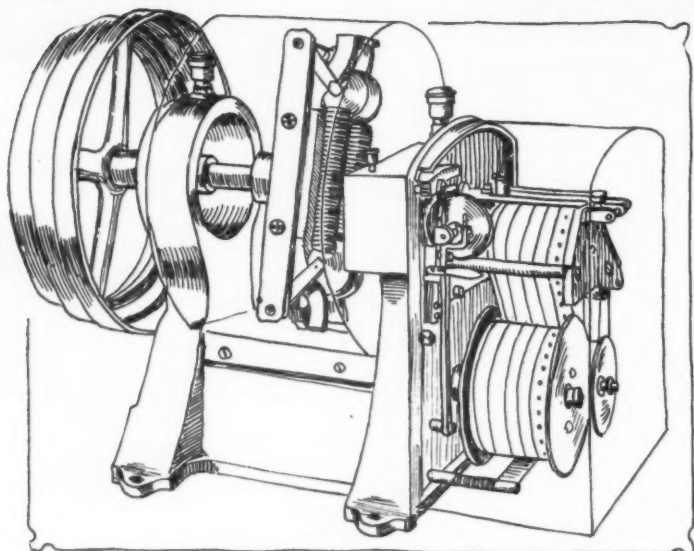


Fig. 1—Tachograph A, measures speed variations

Tachograph Measures Number of Revolutions

Instrument Will Register Also Velocity of Trains or Automobiles—Dr. Horn Is Inventor

Lines on Chart Indicate the Peripheral Speed of Flywheels or Pulleys and Lineal Speed of Belts

TACHOGRAPHS are instruments designed to indicate or register the number of revolutions per minute of steam engines, turbines, motors, gas engines, shafting, etc.; the peripheral speed of flywheels or pulleys; lineal speed of belts and machine tools and the velocity of trains, street cars, automobiles or other vehicles. These instruments are inventions of Dr. Horn and are manufactured by the Industrial Instrument Co., Foxboro, Mass.

Based on the Centrifugal Governor Principle

This instrument's operation is based on the centrifugal governor principle. Masses are so mounted on a shaft that they, revolving with it, tend to fly off under the influence of centrifugal force. This force is resisted by springs, or weights in some types, so that the resultant motion of the masses relative to the shaft depends upon the rate of revolution, and is indicated on a graduated dial or chart through a link and pointer. The instruments operate equally well in either direction, and can be used on machines which revolve in alternate directions. The dials or charts may be divided to read either in revolutions per minute or second, in meters or feet per minute or second, kilometers per hour, or any other convenient unit. The maximum graduations of these instruments may be two, four, or eight times the minimum, as for example, from 300 to 600 revolutions per minute, 15 to 60 revolutions per minute or 75 to 600 revolutions per minute. The instrument may be driven either by belt and pulley or direct-connected by spring or disk coupling. The capacity of Tachometers that are direct-connected must be chosen so that the speed of the spindle corresponds to the speed of the shaft to be measured, or a suitable bevel gear must be built into the instrument. The indicating mechanism is pro-

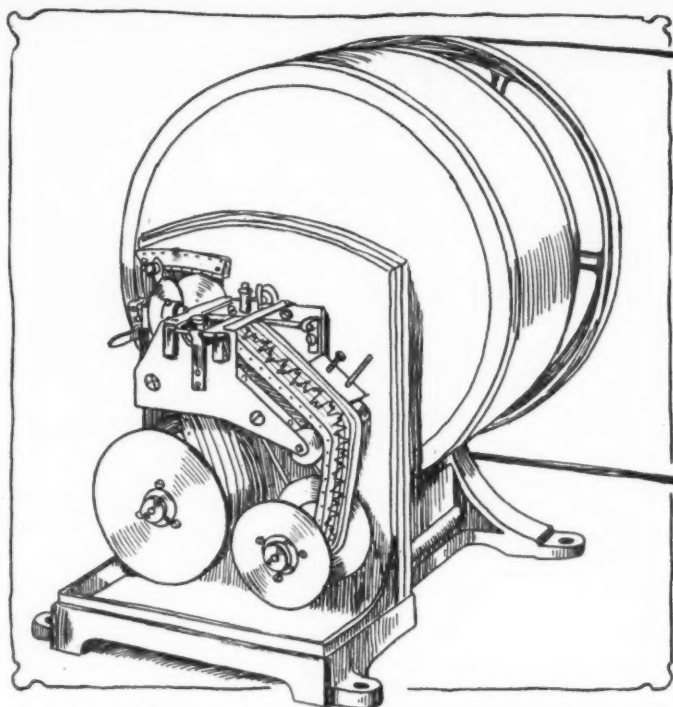


Fig. 2—Tachograph D for measuring minute engine variations

vided with a dampening attachment, so that small variations in speed, due to irregularities in drive, will not vibrate the pointer. This damper produces a steady pointer, without interfering with its accuracy. The degree of dampening effect can be regulated in such a manner that only mean variations in speed are indicated or that even minor variations will be shown.

Ranges Up to 24 Per Cent.

The first instrument, Tachograph A, Fig. 1, is designed to register with the greatest accuracy on a paper chart variations in speed of a machine under different loads or conditions of service. The range of this recorder is from 12 to 24 per cent. of the mean number of revolutions. To obtain as high a degree of sensitiveness of the Tachograph as possible, so that it will register accurately slight variations in speed, as, for example, angular variations during one revolution of the flywheel of a steam engine or gas motor, the centrifugal weights are made large enough so that the inertia effect of the recording mechanism, moved by them, is negligible. The mean number of revolutions of the centrifugal pendulum is, therefore, chosen as 500 and the centrifugal force on the revolving masses, which are arranged on a wide radius, amounts to more than twenty times their weight. Between the revolving masses are placed two strong spiral springs, that are attached directly to them and not to the connecting links. The radial motion of the revolving masses is transmitted to the recording pen, therefore it will follow all variations in speed without being influenced by the momentum of the weights. The transmitting mechanism is of the very lightest design, being made of aluminum. Friction errors are negligible. The dimensions of different parts of levers and springs are chosen so that the recording pen is advanced proportionately to increase in velocity. The pen starts to move at a speed 12 per cent. below the mean number of revolutions and continues to a velocity of 12 per cent. above the mean, that is, from 440 to 560 revolutions. If desired, a pair of extra springs can be furnished for a range of plus or minus 24 per cent.

The travel of the recording pen is 24 millimeters. Owing to this small range, minute variations in the speed produce noticeable deviations in the curve, of about 2 millimeters for a 1 per cent. variation. Variations of .25 per cent. can be clearly observed on the chart. The pen, pen arm and guides are so designed that the pen may be raised from paper by means of a

lever. The pen screws into its holder and may easily be removed. It draws a fine, clear line.

The paper band, 100 meters long and 60 millimeters wide, is driven by the tachometer shaft, and can run at a speed of 1, 2, 3, 10 and 15, and 20 millimeters per second as desired. It is automatically wound upon the other cylinder. By means of a lever it is possible to start, stop or change the speed of the paper band while the instrument is in operation. The chart coordinates are rectangular. The mean number of revolutions of the Tachometer is 500 per minute. It is furnished with step pulleys of three steps or an iron spindle on which may be placed wooden pulleys of required diameters. The width of the pulley is 70 millimeters, and that of a single step is approximately 23 millimeters, which is suitable for a belt of 20 millimeters width. These pulleys, which are made of aluminum, are exceedingly light, neatly turned and accurately balanced, so that they will not introduce flywheel effect. A push button attached to a needle is provided for the purpose of marking special time points on the paper. If, for example, it is desirable to mark on the record the instant a crank is on dead center, the push button is pressed slightly, and the recording pen marks that part of the paper band underneath at the moment the button is pressed. Such time contacts can also be operated electrically if a simple electro-magnet is attached.

Detects Motor's Minute Irregularities

Fig. 2 shows Tachograph D, an instrument which makes possible the investigation of minute irregularities in speed of motors and machines, even the variations in speed of motor during one revolution. This Tachograph is also well adapted for testing the influence on speed of the reciprocating parts of steam engines; the action of governors, etc. The construction is in principle the same as A, but it is more sensitive, registering a 1 per cent. variation by a line five times as long, making it possible to record with accuracy slight variations which follow each other in quicker succession. It is claimed that prominent scientists and engineers have in many cases verified their theoretical calculations with these delicate records. Should the periodicity of the centrifugal pendulum be equal to that of the machine under test the Tachograph would record variations too large. Such, however, would be the case only when the irregularities in the machine are great. In such cases, accurate results can be obtained by using another pair of springs, with a different periodicity.

Aluminum Alloys Used for Lightness

Fig. 4 shows a tachogram from an old gas engine. The lines on the left of the chart show it with a load and those on the right show without a load. The two diagrams, Fig. 3, will explain the dampening period of the pendulum oscillations. They are taken with a paper speed of 20 millimeters per second at a uniform speed of 500 revolutions per minute. The point of the recording pen was withdrawn by hand and the pen was suddenly re-

leased when at 3 per cent. below the normal. All masses connected with the pendulum, which would act only to increase the inertia, and all masses on the transmission arrangement and recorder, which would interfere with quick operation, are reduced to a minimum by using light, strong aluminum alloys for these parts.

New Bumper Design for Automobiles Covers Front Wheels

FOND DU LAC, WIS., Dec. 22—E. M. McGowan, a lawyer at Fond du Lac, Wis., has perfected a fender appliance for motor cars which it is proposed to manufacture for the general market. The appliance consists of two wing-like frames which when not in use hang directly in front of each of the front wheels. The frames are of steel with lattice interwoven in the frames, and are connected to the front springs by a hook and spring operated by a foot pedal in the front compartment of the car. When the pedal is depressed the fenders drop into position from their own weight and form a scoop which brushes aside or picks up any object it comes in contact with. The present state of the appliance makes it suitable for motor trucks, but Mr. McGowan believes he can perfect it to the point where it will be sufficiently light and compact for use on pleasure cars. The spread of legislation requiring fenders on motor-propelled vehicles gives the idea considerable opportunity, it is stated. Nothing has been done toward providing manufacturing facilities, but Fond du Lac capital has interested itself to avoid the sale of patent rights to outside capital.

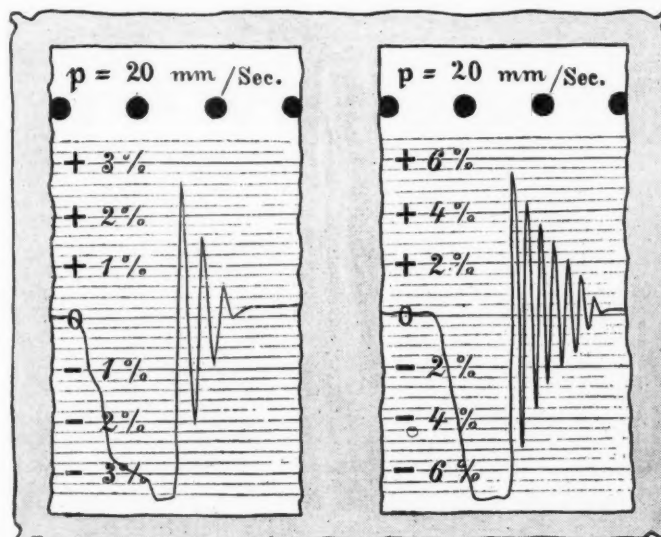


Fig. 3—Diagrams showing dampening period

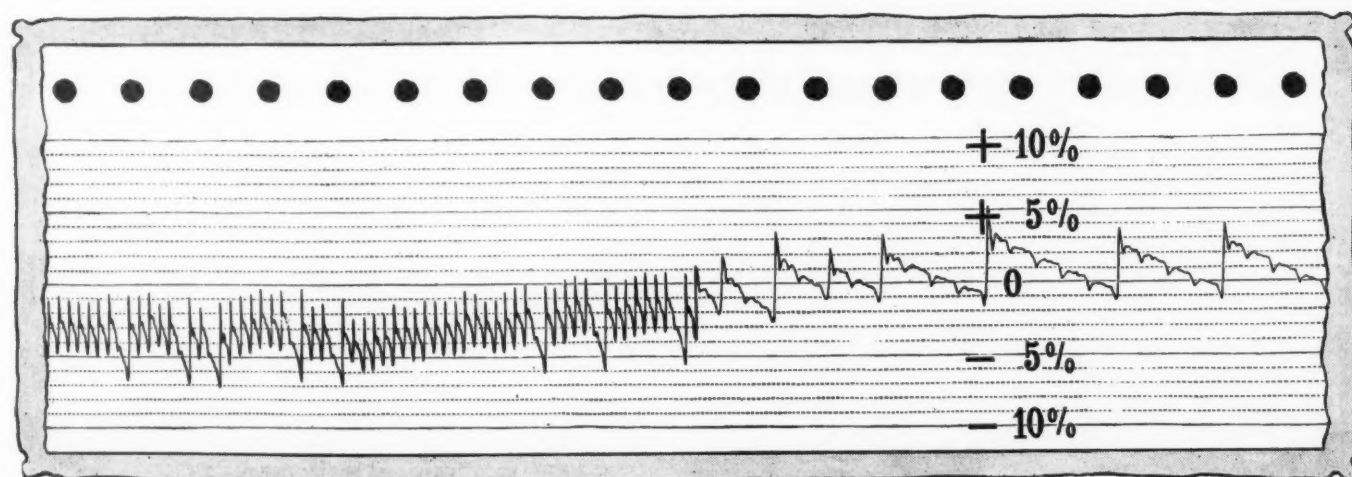


Fig. 4—Tachogram from an old gas engine

Recent Incorporations in the Automobile Field

AUTOMOBILES AND PARTS

AMARILLO, TEX.—Northwest Motor Co.; capital, \$10,000; to deal in automobiles. Incorporators: T. M. Ellis, Turner Ellis, O. M. Boynton.
 DAVENPORT, IA.—Interstate Automobile and Supply Co.; capital, \$25,000; to deal in automobiles. Incorporators: F. A. Seeman, R. E. Beedee.
 DETROIT, MICH.—Ontario Motor Co.; capital, \$10,000; to deal in automobiles. Incorporators: E. F. Gerber, H. C. Baldwin, C. L. Mann.
 DETROIT, MICH.—Perrett-Barber Motor Sales Co. capital, \$10,000; to deal in automobiles. Incorporators: W. M. Perrett, Z. C. Barber.
 ELIZABETH, N. J.—Martin Automobile Co.; capital, \$10,000; to deal in automobiles. Incorporators: F. W. Hand, William Hand, R. D. Martin.
 FORT WAYNE, IND.—Fort Wayne Auto Supply Co.; capital, \$50,000; to deal in automobiles. Incorporators: J. M. Carmer, J. A. Brewer, H. H. Criswell.
 FUQUAY SPRINGS, N. C.—Fuquay M. C. Co.; capital, \$25,000 to deal in automobiles. Incorporators:

C. W. Howard, C. E. Cheek and others.
 HANOVER, MASS.—Hanover Rubber Co.; capital, \$25,000; reclaiming rubber. Incorporators: G. J. Clark, C. J. Ellis, A. C. Sellman.
 HOUSTON, TEX.—Carr Motor Co.; capital, \$10,000; to deal in automobiles. Incorporators: R. C. Carr, R. E. Goree, A. G. Ruggles.
 INDIANAPOLIS, IND.—Crabb Auto Sales and Accessories Co.; capital, \$10,000; to deal in automobiles and accessories. Incorporators: G. L. Crabb, J. D. Thornton, H. M. Wolfe.
 MINNEAPOLIS, MINN.—H. E. Wilcox Motor Co.; capital, \$3,500,000; to manufacture motor trucks. Incorporators: H. E. Wilcox and others.
 NASHVILLE, TENN.—Convertible Automobile Body Corp.; capital, \$250,000; to manufacture automobile bodies. Incorporators: L. Lewkowicz, E. I. Gottlieb, M. Kaplan.
 TORONTO, ONT.—Canadian Bartlett Automobile Co., Ltd.; capital, \$1,000,000; to build automobiles, etc. Incorporators: Francis Watts, J. A. Donovan and others.

TULSA, OKLA.—New State Auto & Supply Co.; capital, \$20,000; to deal in automobiles and accessories. Incorporators: F. S. Snow, M. M. Shaw, G. E. Davis.

GARAGES AND ACCESSORIES

CLEVELAND, O.—Crotty Co.; capital, \$20,000; general garage business. Incorporator: A. B. Crotty.
 DAYTON, O.—Bobra Spark Plug Co.; capital, \$12,000; to manufacture automobile spark plugs. Incorporators: C. H. Braselton, D. H. McKenzie.
 DETROIT, MICH.—Automobile Specialties Sales Co.; capital, \$2,000; to deal in automobile accessories.
 WILMINGTON, DEL.—Murray Transfer Co.; capital, \$25,000; general garage business. Incorporators: Claude Murray, N. W. Murray, R. C. Rogers.

CHANGES OF NAME AND CAPITAL

PHILADELPHIA, PA.—Mecca Tire Co.; capital increased from \$100,000 to \$500,000.

New Agencies Established During the Week

PASSENGER VEHICLES

Place	Car	Agent	Place	Car	Agent
Albion, N. Y.	Maxwell	Kelsey & Peterson.	Owosso, Mich.	Chevrolet	M. Kalaher.
Ashland, Pa.	Maxwell	H. J. Williams.	Paris, Ill.	Maxwell	O'Hair & Alexander.
Ashley, O.	Maxwell	M. M. Powell & Co.	Parkersburg, W. Va.	Maxwell	Logan Cge. & Auto Co.
Atlantic City, N. J.	Marathon	Atlantic Motor Sales Co.	Pembina, N. D.	Maxwell	G. G. Thompson.
Baltimore, Md.	Chevrolet	Poehlman Auto Co.	Philadelphia, Pa.	Maxwell	Gibbons Wetherill Service Co.
Bay City, Mich.	Chevrolet	Garner Auto Sales Co.	Pikeville, N. C.	Maxwell	Pikeville Garage & Motor Co.
Berlin, Neb.	Maxwell	F. J. Nutzman.	Pomona, Cal.	Oakland	Truston Clark.
Berwick, Pa.	Maxwell	Houck & Stall.	Pond Creek, Okla.	Maxwell	F. J. Gentry.
Brunswick, Ga.	Maxwell	Young's Garage.	Port Jervis, N. Y.	Maxwell	Rutan Auto Co.
Buffalo Center, Ia.	Maxwell	J. F. Buggy.	Portland, Ore.	Chevrolet	Northwest Chevrolet M. C. Co.
Capac, Mich.	Maxwell	H. C. Seigel.	Providence, R. I.	Kisselkar	Nock Auto Co.
Catawissa, Pa.	Maxwell	Gunther & Knittle.	Reed City, Mich.	Buick	Theodore Schmidt.
Charlottesville, Mich.	Chevrolet	Fritz & Bolock.	Rhineland, Wis.	Moon	Oncida Garage & Machine Co.
Clarendon, N. Y.	Maxwell	Cole & Redinger.	Rhineland, Wis.	Moon	Oncida Garage Co.
Clarksburg, Pa.	Moon	Clarksburg Auto Co.	Richland, Ga.	Maxwell	W. L. Chappell.
Cleveland, O.	Imp	H. L. Wilkinson.	Rib Lake, Wis.	Maxwell	Geo. F. Braun.
Cleveland, O.	Jackson	Mahon Bros.	River Rouge, Mich.	Maxwell	A. J. Polk & H. L. Nieman.
Corwith, Ia.	Maxwell	G. H. Oxley.	Rosedale, Tex.	Moon	J. C. Lockhart.
Dallas, Tex.	Velie	Shelton-Morris Auto Co.	Saginaw, Mich.	Maxwell	Mutscheller Bros.
Dayton, O.	Moon	F. W. Blum.	San Diego, Cal.	Oakland	P. M. Price.
Detroit, Mich.	Chevrolet	Monroe Sales Co.	San Francisco, Cal.	Chevrolet	Reo-Pacific Auto Co.
Dike, Ia.	Maxwell	Johnson & Anderson.	San Francisco, Cal.	Marathon	Linz-Sanborn Motor Co.
Dunkerton, Ia.	Maxwell	Liebert Bros. Auto Co.	San Francisco, Cal.	Maxwell	Bonnheim-Moore M. C. Co.
Eddyville, Neb.	Maxwell	Eddyville Garage Assn.	San Francisco, Cal.	Oakland	George J. Bing.
Elgin, Ia.	Maxwell	H. D. Yack.	Sandusky, O.	Marathon	J. S. Catlin.
Enid, Okla.	Maxwell	Oklahoma Auto Co.	Santa Barbara, Cal.	Marion	J. S. Catlin.
Fredericktown, Mo.	Maxwell	J. F. Perringer.	Saylorsburg, Pa.	Maxwell	S. C. Newhart.
Freeland, Pa.	Maxwell	J. W. Boyle.	Schenectady, N. Y.	Maxwell	Chris. C. Kehoe.
Fremont, Neb.	Moon	A. Koyen.	Scranton, Pa.	Maxwell	P. J. Needham.
Gallipolis, O.	Maxwell	Stewart Garage.	Seattle, Wash.	Four Wheel Drive.	E. J. Kennedy.
Goshen, N. Y.	Maxwell	N. H. Wilcox.	Seattle, Wash.	Kisselkar	Metropolitan Car Co.
Grundy Center, Ia.	Maxwell	F. D. Deiken.	Selinsgrove, Pa.	Maxwell	Fisher Garage.
Havana, N. D.	Maxwell	J. H. Shannon.	Sheboygan, Wis.	Franklin	The E. & H. Motor Co.
Hingham, Mont.	Maxwell	Sorenson & Malland.	Shelbyville, Ind.	Maxwell	Means & Wagner.
Holland, Ia.	Maxwell	O. A. Ontjes.	Sheffield, Ala.	Maxwell	J. H. Lester Auto Co.
Holyoke, Mass.	Marathon	J. Z. Ouimet.	Shenandoah, Pa.	Maxwell	John Paskey.
Janesville, Wis.	Maxwell	Kemmerer Garage.	Shrewsbury, N. J.	Maxwell	I. R. King.
Julian, Neb.	Maxwell	Wilberger & Stowell.	Sioux City, Iowa	Oakland	C. E. Daily.
Kalamazoo, Mich.	Moon	W. O. Harlow & Co.	Sioux Falls, S. D.	Oakland	A. L. Barth.
Lake Crystal, Minn.	Maxwell	W. W. Harris.	Sioux Falls, S. D.	Maxwell	Hessenius Auto Co.
Lake Park, Ia.	Maxwell	Lake Park Implement Co.	Springfield, Mass.	Moon	J. W. Chesbro & Co.
Leighton, Pa.	Maxwell	Serfas M. C. Co.	Springfield, Mass.	Partin-Palmer	Waverley Auto Garage.
Liberty, N. Y.	Maxwell	G. M. Palmer & Co.	St. Johns, Mich.	Maxwell	Lee Kellam.
Litchfield, Mich.	Maxwell	R. H. McKenzie.	Stamford, N. Y.	Maxwell	W. E. Thompson.
Lockhart, Tex.	Moon	J. R. Lipscomb.	State College, Pa.	Maxwell	State College Trans. Co.
Los Angeles, Cal.	Chevrolet	Reo-Pacific Auto Co.	Stuart, Neb.	Maxwell	Wm. Krotter Co.
Madison, Ind.	Maxwell	Stacy & Maddox.	Suttons Bay, Mich.	Maxwell	J. A. Ott.
Mancelona, Mich.	Buick	Burt Wright.	Swissvale, Pa.	Maxwell	Swissvale M. C. Co.
Manhattan, Kan.	Maxwell	J. C. Schafer.	Tabor, S. D.	Maxwell	Tabor Motor Co.
Manistique, Mich.	Maxwell	E. J. French.	Tallula, Ill.	Maxwell	Tallula Auto Co.
Manitowoc, Wis.	Maxwell	Hall Bros.	Terre Haute	Franklin	The Terre Haute Auto Co.
Mason, Tex.	Maxwell	Gresham & Logan.	Terrell, Tex.	Maxwell	T. L. Seitzler.
Mathis, Tex.	Moon	C. C. Braden & Co.	Temple, Tex.	Maxwell	Temple M. C. Co.
Menominee, Wis.	Maxwell	Menominee Garage.	Tiffin, O.	Jeffery	J. W. Reiff.
Middleburg, Vt.	Marathon	Cobb's Garage.	Toledo, O.	Commerce	Bunnell Auto Sales Co.
Middletown, N. Y.	Maxwell	North End Garage.	Topeka, Kan.	Maxwell	Independent Auto Co.
Milledgeville, Ill.	Maxwell	Miller Bros.	Towanda, Pa.	Maxwell	Towanda Motor Co.
Milwaukee, Wis.	Empire	J. A. Smith Auto Co.	Trenton, N. J.	Maxwell	Toman Bros.
Milwaukee, Wis.	Meteor	Rhode Automobile Co.	Tripole, Ia.	Maxwell	Tripole Implement Co.
Minneapolis, Minn.	Abbott-Detroit	A. F. Chase & Co.	Trippe, S. D.	Maxwell	Geidd Case & Co.
Minneapolis, Minn.	Dorris	Martin Sales Co.	Troy, N. Y.	Maxwell	Ilium Garage.
Minneapolis, Minn.	Downing-Detroit	Auto Parts Co.	Unionville, Mich.	Maxwell	C. H. Geyer.
Missoula, Mont.	Maxwell	Martin Sales Co.	Uplands, Cal.	Oakland	Domer & Wilson.
Monesson, Pa.	Maxwell	Chicago Garage.	Valentine, Neb.	Maxwell	Valentine Auto Co.
Monowi, Neb.	Maxwell	Lion Motor Sales Co.	Westfield, N. Y.	Maxwell	Main Street Garage.
Murdock, Neb.	Maxwell	E. W. Allen.	West Lebanon, Ind.	Maxwell	Ira Cadwallader.
Nashville, Mich.	Maxwell	William Gehrts.	Wheaton, Kan.	Maxwell	Kufahl Hardware Co.
Nashville, Mich.	Moon	A. E. Bassett.	Wheaton, Minn.	Maxwell	Neuman's Auto Sales Co.
Newfoundland, N. J.	Maxwell	Lawrence & Sons.			
New Prague, Minn.	Maxwell	F. A. Hoagan.			
Newberry, S. C.	Maxwell	Tuma & Hanzel.			
Niagara Falls, N. Y.	Maxwell	Summer's Garage.			
North Adams, Mich.	Maxwell	Peter Lammerts.			
Odell, Ill.	Moon	J. M. Williams.			
Oklmulgee, Okla.	Franklin	Cosgrove & Cleary.			
Olean, N. Y.	Kisselkar	William A. Burke.			
Ottoman, Va.	Maxwell	Lester & Thomas.			
Omaha, Neb.	Kisselkar	L. B. Cottingham.			
		Oppen Van Vleet Auto Co.			

COMMERCIAL VEHICLES

Milwaukee, Wis. Federal Creek Motor Sales Co.
 Seattle, Wash. Republic Pope-Hartford M. C. Co.

ELECTRIC PASSENGER VEHICLES

Minneapolis, Minn. Woods Owl Electric Gar. Co.

Accessories for the Automobilist

FORD LEECE-NEVILLE System—

An electric starting and lighting system, Fig. 1, for Ford cars has just been announced by the Leece-Neville Co., Cleveland, O. It is of the single-unit type; that is, motor and generator comprise one machine and operate at 6 volts. The motor cranks the engine at a speed of 150 revolutions per minute and is started by simply pushing a button. As soon as the engine starts, the machine is automatically converted into a generator which furnishes current for lighting and charging a storage battery. One of the features of the Leece-Neville system is that stalling of the motor can be prevented by pressing the starter button, the electric motor being strong enough to propel the car on high gear. The motor generator is connected to the engine crankshaft by means of a silent chain, which runs in a grease-packed case.

Motorflex Clutch—To obtain a smooth clutch engagement under all conditions and thus reduce the strain on motor and transmitting mechanism the Motorflex Equipment Co., 200 Fifth avenue, New York City, is offering the clutch shown in Fig. 2, the invention of Sidney L. Prescott. The original feature contained in this design is the use of a heavy helical spring in connection with a screw and nut between the driven clutch member and the transmission shaft which gives easy starting no matter how quickly the clutch is let in. In other respects this clutch is conventional, the drive being obtained through a single plate made of gun metal and fitted with cork inserts which is forced against the flywheel surface by a ring actuated by helical springs on its rim. Now that a general idea of the device has been obtained the action of the special feature that gives easy engagement will be described. The friction plate drives a sleeve which is threaded internally to receive a screw that slides on a splined shaft running to the gearset. Between the screw and nut there is a heavy coil spring. When the clutch is first engaged the sleeve or nut is screwed

up and the spring is compressed until sufficient friction is obtained between the threads to carry the driving stress without slippage. It is claimed that this clutch not only gives an easy start but that it takes up changes in the driving strain. The exact position of the nut is determined by the amount of power transmitted. Tests have been made with this clutch on a 6000-pound machine, and even when the car was back into a ditch the motor raced and the clutch dropped in, the car climbed out without jerk and without stalling the motor.

Salus Tire Valve—A tire valve which does not permit a tire to be inflated beyond a given pressure, which relieves excess pressure and which tells also when a tire needs more air, is being marketed by the Sioux City Machine & Tool Co., Sioux City, Ia. The Salus valve is placed over the valve stem of the tire. Should a tire be designed to carry 75 pounds air pressure and should running conditions so heat the tire as to increase that pressure, the Salus will, it is claimed, free the tire of the excess air and thus relieve the pressure. A plunger on the cap of valve tells whether the tire needs more air.

Turning Headlights—Headlights that move with the front wheels and thus illuminate the roadway directly ahead of the car when rounding a curve as well as when traveling straight ahead can be had by using an attachment made by the Headlight Support Co., Dime Bank Building, Detroit, Mich. The headlight supports, Fig. 3, are designed to fit any car and consist of two vertical tubes that are clamped to the frame members. Inside each tube there is a shaft which carries the lamp on its upper end and

which has an arm on its lower extremity which is slidably attached to the tie rod and thus turns the headlights with the front wheels. The supports can be easily put on by any one, as no fitting is required. Besides being more convenient than the ordinary headlight they are safer, and for this reason have been christened Safety First Turning Headlights.

Ellis Gasoline Purifier—In this device the heavy dirt and the water are collected in a deep sediment chamber and the finer particles of foreign matter are prevented from passing through the carburetor by a very elaborate filter. In the bottom of the sediment chamber there is a plug for draining out the sludge that collects there. In passing through the filter the gasoline first encounters a wire screen, then a thickness of felt, next a large amount of broken quartz, then another filter, and finally another wire screen. The screens not only serve to prevent dirt from flowing through, but hold the felt and quartz in place. This device is made by the National Sales Co., 1000 Boylston street, Boston, Mass., and sells for \$3.50.

The Auto Heater—Another heater operated by the heat of the exhaust gases comes from the works of the Cincinnati Pump Co., Liberty and Clay streets, Cincinnati, O. It consists of a strong, light aluminum casting, 10 by 26 by 1.5 inches, through which the burned gases pass, and which is laid flush with the floor. The edge of the floor is lined with an asbestos fiber cement to prevent the heater from burning or scorching it. The quantity of heat is easily regulated by a valve in the branch running from the exhaust pipe to the heater.

Scientific Garage Heater—A special garage heater using illuminating gas as fuel has been brought out by the Scientific Garage Heater Co., Cleveland, O. The claim for this heater is that it is safe to operate, circulates clean, warm air through the garage, and does not give off any obnoxious odors. Little attention is required and a pilot light does away with the necessity of relighting the heater when it is desired to turn on the heater. It is 38 inches high, 39 inches long, and when in place projects 1 foot from the wall. Its price is \$25.

Ford Coupé—A handsome coupé body made for Ford cars, Fig. 4, has recently been announced by the Irvin Robbins Co., Indianapolis, Ind. It is designed to seat three people, two on the rear seat and one on a folding seat attached to the front panel, and will sell complete for \$250. Plate glass windows in walnut are fitted and these are guaranteed not to rattle. A clear vision glass

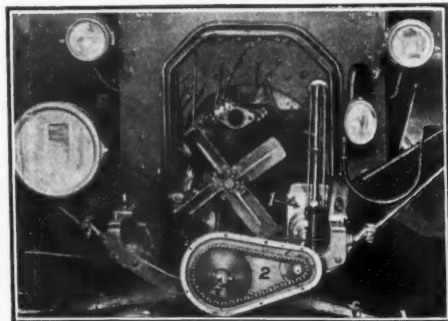


Fig. 1—Leece-Neville Ford electric starting and lighting system

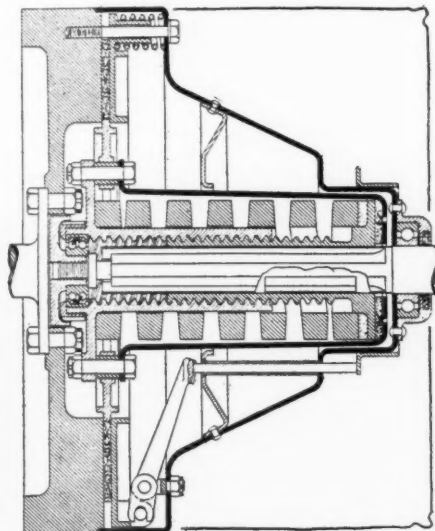


Fig. 2—Motorflex clutch, showing large helical spring that makes starting easy

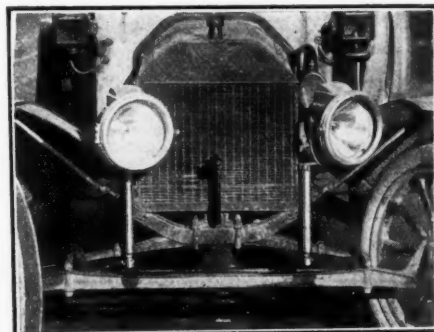


Fig. 3—Safety First turning headlights showing method of attachment

front is used, the upper half overlapping the lower and thus preventing the entrance of rain. The interior of the car is finished in gray and black striped whip cord with a dark green carpet for the floor. A dome light with a 12-volt, 4-candlepower tungsten burner and switch is a feature of the interior appointments. Spare tires, tools and other necessary equipment are carried in a roomy compartment at the rear of the car. No special fitting is necessary in order to install this body, as the front partition will fit over the dash and the same body irons and bolts are used as with the regular Ford body.

Continental Rim Tool—A handy tool for detaching Continental demountable rims is illustrated in Fig. 5. The illustration indicates the method of taking the rim apart; the tool is inserted as indicated and the handle is pushed over until the rim is loose. For putting the rim together the tool is turned around and brought to bear at the points shown, when a pull on the handle tightens the rim. This device is made by the Standard Welding Co., Cleveland, O.

Argo Electric Heater—An electric heater that is designed for use on closed electric vehicles is one of the recent products of the Argo Electric Vehicle Co., Detroit, Mich., and is used on their cars. It is neat and pleasing in appearance, is small enough to be out of the way, yet heats the car without consuming much current.

Pierce Speed Controller—The owner of a truck, delivery wagon, taxicab or even a touring car, where children drive, may limit the speed of his car by using the controller, Fig. 6, put out by the Pierce Speed Controller Co., Anderson, Ind. It is attached to the intake manifold, where a butterfly valve throttles the mixture as the car speed is increased. The controller drive is through a flexible shaft operated by a pinion and gear on the front wheel, and it is this feature that distinguishes it from motor governors that are driven by the motor and therefore limit the motor speed rather than car speed. The maximum speed is easily varied by unlocking the cover, and for pleasure car installations provision is made for dash adjustment of the controller so that maximum car speed can

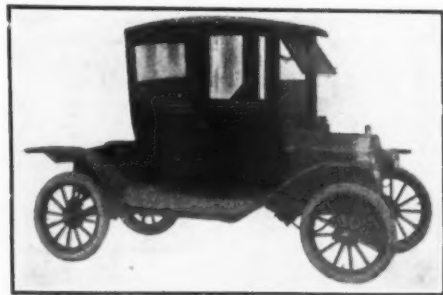


Fig. 4—Ford coupé made by the Irvin Robins Co.

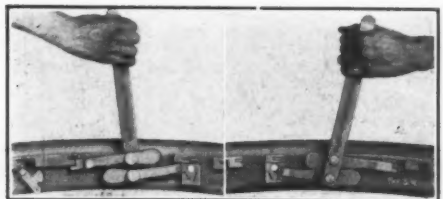


Fig. 5—Continental rim tool

be instantly changed when the younger members of the family take the wheel. The controller mechanism consists of a centrifugal governor whose weights fly out as the speed increases. This raises a vertical rod operating a rack and pinion and closing the butterfly valve located in the intake pipe.

Clark Safety Crank—The Clark Crank Co., Muncie, Ind., has brought out a crank for motor cars, Fig. 7, the use of which prevents any injury to a person due to the motor kicking back. The device is simple, depending upon pawls and a bronze ratchet for its work. The safety feature is obtained by means of two steel pawls contained in the hub of the crank. The Clark company is offering the safety crank in styles suitable for all makes of cars, and with four finishes—nickel, brass, oxidized or japan. The price is \$10.

Thurber Rotary Starter—Many interesting features are seen in the compressed-air starter produced by the Thurber Rotary Starter Co., Detroit, Mich. Air-compressor and starter are combined in a single casting, Fig. 8, air-cooled compressor cylinders being at the front and the starter on the other side of the casting. The starting motor is a rotary type in which an eccentric disk rotates in a cylindrical chamber, the drive being obtained through the expansion of the air against radial plates that are slidably located in the disk. The starter is capable of spinning the motor at a speed of 250 revolutions per minute and is supplied with air at a pressure of 250 pounds from a reservoir of sufficient capacity to start a 40-horsepower engine 150 times. The compressor is a two-cylinder, air-cooled model with dropped-forged connecting rods, a ball-bearing crankshaft and cylinder dimensions of 1.75 by 1.5 inches bore and stroke. The complete starter unit is very compact and is easily installed.

Evans Alignment Joints—These joints, Fig. 9, are designed to be used anywhere on an automobile where the total movement is not over 4 degrees plus or minus. The coupling is made up of two main parts, a male and female member, which pivot about the cup like center caps by which alignment is secured. The male member consists of six equally spaced teeth which fit into corresponding slots in the other member and flexibility is secured by the longitudinal movement of the teeth in these slots. The joint is dustproof, being entirely inclosed and sealed where the male member rubs against the casing by a felt packing ring. The maker is the Merchant & Evans Co., Philadelphia, Pa.

Colson Pedal Gearshift—Thomas W. Colson, Chicago, Ill., has brought out a mechanical gearshift which dispenses with the ordinary shifter lever. There is a pedal for each speed, and by a single forward movement of any pedal the clutch is automatically released, the gears are brought to neutral and the new gear is engaged. The parts of the gearshift are carried on the clutch shaft. It is claimed that this system requires little attention beyond occasional oiling and that its upkeep cost is negligible.

Crismo Carbon-Remover—A liquid carbon remover has been brought out by the Crismo Co., Topeka, Kan., which, when introduced through the air intake of a carburetor while the motor is running, is said to free the pistons and cylinders of carbon. It is claimed also that the liquid prevents the accumulation of carbon. The



Fig. 6—Left, Pierce speed controller
Fig. 7—Center, Clark safety crank
Fig. 8—Right, Thurber rotary starter

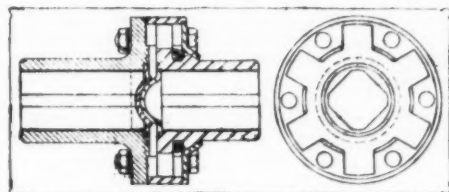


Fig. 9—Evans alignment joints

liquid is used while the motor is hot and in operation, and besides being said to be an effective carbon remover is claimed not to contain acid or anything injurious to the metals of the motor. It is sold in gallon cans at \$3.50.

Caldwell Compressor—The Chicago Pneumatic Tool Co., Chicago, Ill., is putting out several sizes and styles of one and two cylinder air-cooled, belt-driven compressors for garage work. These vary in capacity from 4 cubic feet per minute for the 3.5 by 4-inch single cylinder style to 25 cubic feet per minute for the 5 by 6-inch double-cylinder model. Connecting-rods are fitted with phosphor-bronze bushings and adjustable crankpin bearings. Crankpins and piston pins are hardened steel. The main bearings are lubricated by oil cups and the crankpin bearings by grease cups.

Frezenot Radiator Liquid—An anti-freezing solution that has a freezing point of 54 degrees below zero is made by the Rub-on Mfg. Co., Buffalo, N. Y. It will not corrode the metal parts and will last all winter without replenishing, it is claimed. By the barrel it sells for 50 cents a gallon and in 3 or 5 gallon jacket cans for 60 cents.

Minerva Horn—A new signaling device especially designed for Ford cars and of the exhaust operated type is the product of the Minerva Hardware Mfg. Co., Minerva, O. It is a three-tone horn, which is installed by clamping over the end of the exhaust pipe and operated by a door that closes the end of the pipe and thus directs the exhaust gases through the horn. No fitting is necessary for its installation. The price is \$5.

United Steel—The United Steel Co., Canton, O., has brought out a new steel—cross rolled which, it is claimed, eliminates seams and imperfections.

Correction—In the issue of THE AUTOMOBILE for December 4 the address of the Gem Supply Co. was given as New York City. This should have been Waterbury, Conn.

The AUTOMOBILE



The Name Ward Leonard demands recognition

*The world's experts have
voiced their opinion by
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*For 30 years dynamo, η
motor and battery problems
of control have been met and
solved by WARD LEONARD
CONTROLLING SYSTEMS that
are true and right.*

*The WARD LEONARD START-
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means perfect starting and
lighting under every condition.*

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The Ignition Coil is now made a part of
the generator in the

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Six Cylinder



Lighting and Ignition Generator
Four Cylinder

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Automatic Spark Control is a feature of the Westinghouse Ignition System which assures maximum efficiency in the engine with economy of fuel.

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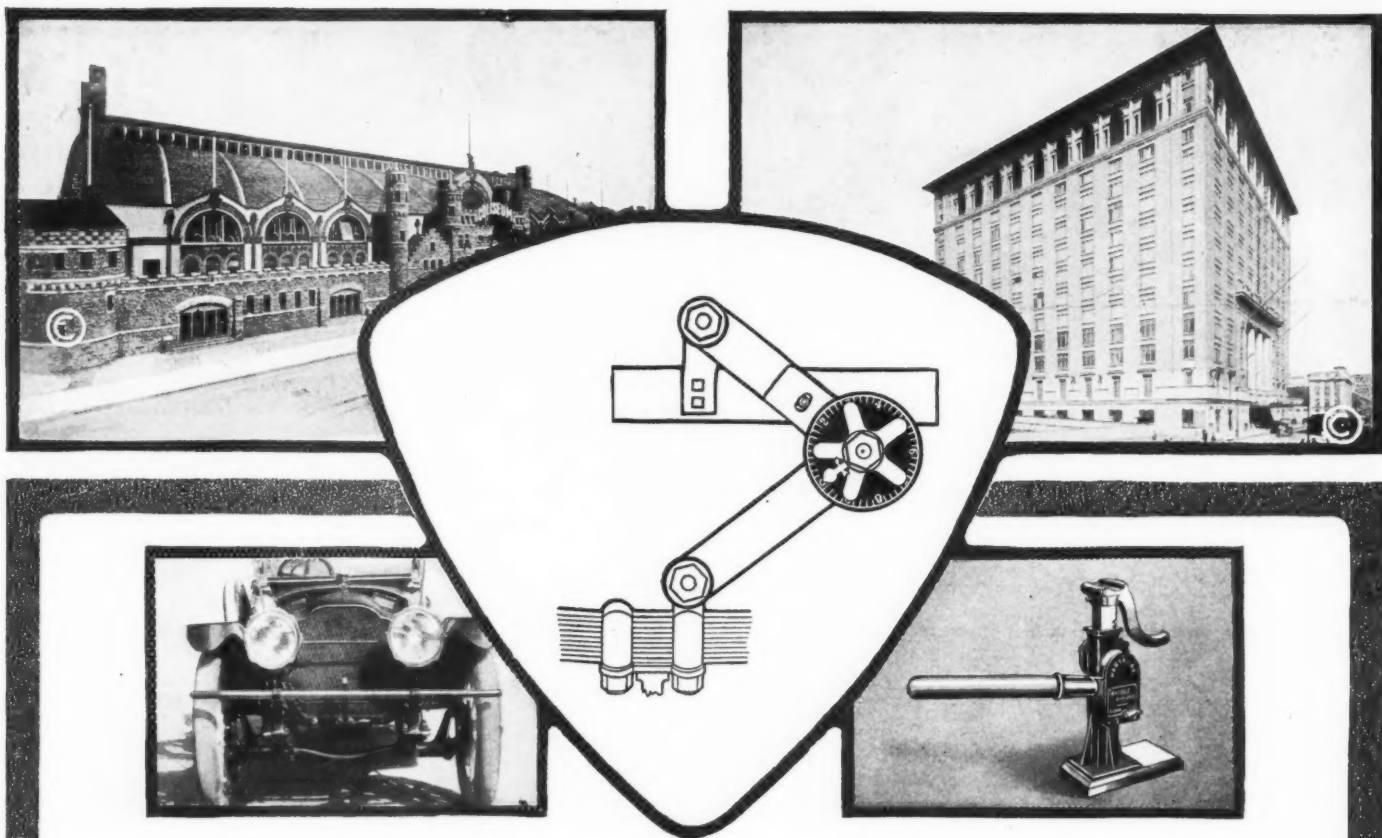
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EFFICIENCY of equipment is as much to be desired in a car as efficiency of construction.

The high degree of efficiency attained in Truffault-Hartford Shock Absorbers, Hartford Bumpers, and Hartford Auto-Jacks is attested by the fact that nearly every high-grade, up-to-date American car is furnished with one or more of these Hartford-built accessories.

Truffault-Hartford Shock Absorbers are included as standard equipment on the output of twenty-five of the greatest automobile factories in the world. They have brought easy riding and greater economy to over 200,000 motorists. The device is yet to be conceived which can satisfactorily take the place of the Truffault-Hartford. Four models including

the New Automatic—be sure to see this latest Truffault-Hartford at the show.

Come and examine the Hartford Auto-Jack. It has three times the lifting efficiency of the ordinary jack—is better designed, better built and better finished without being over-priced. And Hartford Bumpers are designed to give thoroughly effective protection without marring the appearance of car or adding excessive weight. The method by which they are attached is a distinct improvement.

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Our Service is Yours

In New York and Chicago we maintain departments of specialists whose work is to render practical art and copy-writing service for the benefit of our advertising patrons.

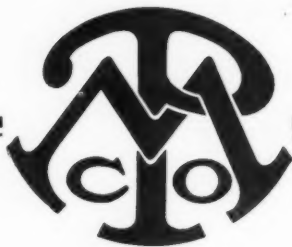
We are prepared to co-operate with you to insure the best possible results from every dollar you invest in THE AUTOMOBILE and MOTOR AGE.

If you need some one to plan and execute an advertising campaign, in whole or in part, call upon us. Our complete facilities are at your disposal.

The Class Journal Co.
New York Chicago



Please mention The Automobile when writing to Advertisers



If Your Invention Is Really Worthy Talk to Motor Patents Company About It

Motor Patents Company has been organized for the purpose of developing meritorious inventions looking toward increased efficiency and economy in Motor Car construction.

This company has ample resources and is prepared to take over on a royalty or profit sharing basis, or to purchase outright, inventions that are fully protected by patents and that seem to possess possibilities for large development.

Only inventions relating to the automobile industry will be considered at the present time, and of these, only those things that are designed to actually increase the efficiency of the car and the economy of its construction, will be accepted.

Motor Patents Company has already acquired patents for a new and greatly simplified and improved speedometer drive. It has exclusive rights under patents pending for a new carrier for extra tires. It has under option patents on two articles which promise, not only greater efficiency and lighter weight, but a substantial decrease in cost of production to the Motor Car maker.

These inventions are developing very rapidly and promise good returns. Under its speedometer drive patents, this company has licensed a number of American companies of international reputation.

Engineers and others having inventions of the
type mentioned are invited to write to

MOTOR PATENTS COMPANY

1214 Dime Bank Building, DETROIT



A VISION
of your car,
smashed on the
slippery curve
ahead—

You have neglected to put on Weed Chains.

You anxiously view the slippery curve ahead and have *a mental picture of your car smashed against a rock.*

Why nurse anxiety and coax calamity—why take such chances when you know

Weed Anti-Skid Chains

Absolutely Prevent Skidding

No other device has ever been invented that takes the place of Weed Chains. All kinds of "make-shifts" have been tried—useless and worthless all. The *real value* of Weed Chains has been proven so often and so satisfactorily during the last ten years that there is no room for argument. They are slipped on in

a moment without a jack. *They don't injure tires* even as much as one little slip or skid. *They never fail* in an emergency and take up hardly any space when not in use. *Send for Booklet proving the efficiency, economy and necessity of Weed Chains.*

Sold for ALL Tires by Dealers Everywhere

Weed Chain Tire Grip Co.,
28 Moore Street - - - NEW YORK

Manufactured for Canada by

Dominion Chain Co., Limited—Head Office: Shaughnessy Bldg., Montreal, Can.

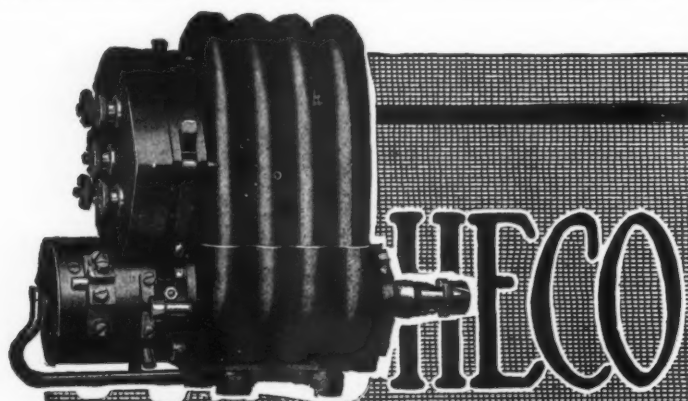


Please mention The Automobile when writing to Advertisers



Every garage and repair man should have a box of these assorted keys on hand. They may be purchased from the leading jobbers of automobile supplies or we can supply same promptly from the factory.

THE WHITNEY MFG. CO.
HARTFORD, CONN.



Low Tension Magnetos

HECO LOW TENSION MAGNETOS are compact in design and construction, and absolutely reliable under all circumstances. A spark of equal intensity is assured both on advance and retard. By means of our patented method of secondary winding, we are enabled to use a greater number of turns of wire than any other secondary of the same size.

The highest voltage or greatest potential are more than four inches apart. This distinctive feature eliminates all dangers of burn out or breakdown in the secondary.

Put your ignition troubles up to us. We are experts in the manufacture of coils, magnetos and spark plugs. Write for our catalog.

HEINZE ELECTRIC CO.
Factories & Gen'l Office, Lowell, Mass.
Sales Office, Detroit, Mich.

60P

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IT STANDS ALONE

FLEKTRA

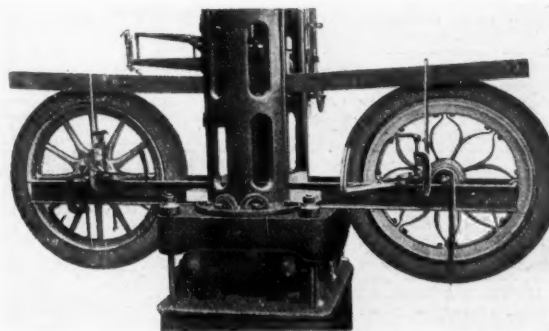
AN AUTOMOBILE BRAKE LINING OF SUPERIOR MERIT

TESTED, TRIED AND PROVEN TO BE THE VERY BEST ASBESTOS FACING

All buyers of Linings and Facings should be in touch with us.

FL HORTON MANUFACTURING CO., BOSTON, MASS.

Vanadium Spring Steel Makes Possible The Ideal Steel Wheel

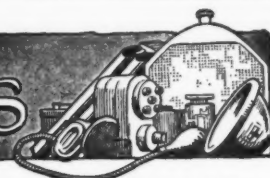


The Ideal Steel Wheel is a wheel which through the use of semi-elliptic springs for spokes is designed to give the necessary resilience to the automobile without the use of pneumatic tires. Dependent on the strength of the spring steel to resist the complicated stresses to which the spokes are subjected, the first success of the device was achieved through the use of Chrome-vanadium steel after extensive tests of various steels. Tests show that with airless tires the Ideal Steel Wheel is 35% more resilient than pneumatic tired wooden wheels and has 7 times the lateral strength. Write for November "Facts" giving full particulars.

American Vanadium Company
310 Vanadium Building, PITTSBURGH



Classified Wants



LINE RATE—.25 one time, .20 three times, .18 six times, .17 thirteen times, .16 twenty-six times, .15 fifty-two times. Minimum 4 lines

Cars for Sale

A FEW RARE BARGAINS

We are specialists in reliable used cars, bodies, engines, etc., and carry an immense stock. Let us know what you are interested in.

Peets-Homan Corporation,
239-241 W. 56th St., New York City.

A REAL BARGAIN IN EITHER A FOUR or six cylinder Thomas. These Cars are in prime condition, the latter essentially new. Must sell immediately, price a secondary consideration. Postal brings full details and convincing information.

R. S. PATTEN,
418 Beard Ave., Buffalo, N. Y.

AUTOMOBILES

Used Autos, latest models. Bargains in leading makes. Advise model desired.

GEO. LAMBERTY,
213 West 69th St., New York.

BARGAINS—BARGAINS—BARGAINS

Is the only thing we handle, from a cotter pin to a complete car. Small and high-powered cars. Engines, Frames, Bodies, Axles, Radiators, Transmissions, Magnetos, Tops, etc. Before buying, let us quote.

PACIFIC MOTOR CAR EXCHANGE CO.,
10 West 62d St., New York.

BARGAINS IN USED CARS

Hudsons, Cadillacs, Chalmers, Fords, Peerless, Packards, Buicks, E. M. F., Cole, Maxwells and others. Special prices. Dealers visiting New York show should call and see these machines. Cars sold separately or in lots.

BRADHURST AUTO CO.
653 St. Nicholas Ave., near West 145th St.
Subway and L Stations W. 145th St.,
New York City.

BARGAIN, THOMAS SIX CYLINDER, 40 horsepower, 4 passenger. Pullman four cylinder, 4 passenger. These cars must be turned into cash at once. M. M. Delivery Co., 125 W. Tupper St., Buffalo, N. Y.

BUICK, 1500-LB. DELIVERY WAGON, NEW solid tires all around, recently been repainted. Will sell at a big bargain.

D. CONDON
2635 Wabash Ave., Chicago. 33

FOR SALE OR EXCHANGE FOR LIGHT six. Will pay difference. 60-hp, 7-pass., fore-door Stearns Car, black and nickel finish. New mohair top; Prestotank. Newly painted in spring. Car in A1 condition. Great power; dem. rims. Address Box 334, Little Falls, N. Y. 28

MARMON 1912 MODEL, SUBURBAN TYPE; lots of extra equipment and accessories; total cost \$3,500.00. In splendid shape, driven entirely by owner. On account of change of location have no use for car. Price \$1,300.00. Address Dept. P, P. O. Box 408, Cincinnati, Ohio.

NEAR-NEW CARS AT LOWEST PRICE.

If you are in the market for a 1912 or 1911 car that is as good as new at a price of $\frac{1}{4}$ to $\frac{1}{2}$ the new cost it will pay you to look over the cars on our floor. Every model of every standard make. LET US KNOW WHICH CAR YOU WANT. We will get it for you at a reduced price.

THE JOHN N. BRISBEN CO.,

22 West 63d (near Bway.), N. Y. City. 22

USED CAR BARGAINS, \$100-\$2000. New open and closed bodies, half cost. New tops, all sizes, \$10. Envelopes \$1. 20th Century Co., 1692 B'way, New York.

NOW IS THE TIME TO MAKE BIG money in livery work with a limousine. We have two Selden limousines, both with extra touring bodies and tops and both in good running order. They can be bought for \$700 each or will sell bodies separately. Write or wire before someone else gets them.

MABBETT-BETTYS MOTOR CAR CO.
252 Court Street, Rochester, New York.

PEERLESS RENEWED CARS

When buying a used car, quality should be considered even more than in a new machine. Unless an automobile has "quality" in every part it will not give satisfaction when it is sold as a used car.

Standard Factory Guarantee.

A Renewed Peerless will give you greater service than any other new car at the same price. Write for renewed car catalogue. Peerless Motor Car Co., of New York.
1760 Broadway.
Newark Branch, 87 William Street.

Results That Count

J. O. Brouillet,
61 Dresden St.,
Springfield, Mass.
September 27, 1913.

The Automobile,
239 W. 39th St.,
New York City.

Gentlemen:—My advertisement has done more than I expected, and I am fully satisfied, so it is not necessary to continue its publication at present.

Very truly yours,
(Signed) J. O. Brouillet.

THOMAS MOTOR CAR CO.

SERVICE AND PARTS DEPARTMENT

1200 Niag. St., Buffalo, N. Y.

Cars Wanted

FIFTY CARS WANTED FOR CASH. Have customers waiting; if you want to sell your car quick consign it to us; no charge whatever; we get our profits over your net figure; it is your privilege to remove car at any time without notice; will send for your car free within 200 miles.

AMERICAN USED MOTOR CAR CO.,
Brooklyn, N. Y.
500 Bergen St. Near Flatbush Ave.

Parts and Accessories FOR SALE

ACCESSORY CATALOG MAILED ON RE-quest, Maxwell dealers and owners, we can supply tops, shields, etc., for your cars. Lowest prices all goods. Write us. Westchester Accessories Co., 1777 Bway., N. Y. City.

A No. 1 BARGAINS

30 H.P. vertical tube radiators..... \$11.00
30 H.P. steering gears complete (Germer type) 12.50
30 H.P. axles, front and rear shaft drive, completely assembled and machined and with artillery wheels and demountable rims, with spring clips, nuts, spare rims, etc..... 82.50
38-42 H.P. 4 $\frac{1}{2}$ x 5 motors, "L" head (continental type), suitable for trucks, boats or pleasure cars.... 250.00
Heat treated pressed steel frame with kick up 15.00
Special racing machine, 90 M.P.H.... 3,500.00
G. J. G. 40 H.P. racer to do 70 M.P.H. 1,250.00

Above are not used or 2d hand.

G. J. G. MOTOR CAR COMPANY,

White Plains, N. Y.

ALL MAKES OF SPEEDOMETER PARTS AT HALF PRICE

GENERAL SPEEDOMETER REPAIR CO.
51 West 63d St., N. Y. City. 21

AMERICAN AUTO TIRE RELINERS,

Inner and Outer Boots.
All Guaranteed Products.
Send for price list.
Local dealers wanted.

AMERICAN RUBBER PRODUCTS CO.,
24 S. Clinton St., Chicago, Ill.

ACCESSORY BARGAINS—WINDSHIELDS

30 CENTS ON THE DOLLAR

Either straight, zig-zag or rain vision; also clear vision. Single or double sections. Black, Brass or Nickel.

TOPS

Brand new Flanders "20" Touring Car tops, made of fine Mohair; complete with Irons, Side and Storm Curtains. Can be made to fit Flanders "20," Ford and Buick "10" Touring Cars. Also other small four-passenger cars. Price \$11.85.

TOOL BOXES

Hayes' make with lock, black enamel, 18x 8x8 $\frac{1}{2}$. Regular price \$4.50; our price \$2.15.

BRASS POLISH

Best made. While it lasts, \$0.45 per gallon.

PRESTO TANKS

Complete and Filled with Gas.
"A" Large size.....\$15.00
"B" Medium size..... 13.00
"E" Small size..... 11.00

ERWIN GREER & COMPANY

1456-64 Wabash Ave. Chicago, Ill.

Accessory Dept.

AUTOMOBILE OWNERS. SEND FOR OUR latest illustrated cut-price catalogue of automobile accessories. Liberty Tire Company, 102 Chambers Street, New York City.

Please mention The Automobile when writing to Advertisers

AMPVO STORAGE BATTERIES.

Surplus stock, must be sold before Jan. 1. Special price for quick sale. Every battery guaranteed, 60 to 140 ampere.

THE AMPVO BATTERY CO.,
3031 Michigan Ave., Chicago, Ill.

ATTENTION, FORD DEALERS.

Complete line of Ford accessories at lowest prices. Before sending elsewhere get our special dealers' price list. This month's specials:

Ford Electric Light Outfit, Ediswan, base 8" and 9", list price, complete, \$7.50; dealers' price, \$2.20.
Ford Magneto Horns (Olympic), list price, \$5; dealers' price, \$3.10.
Goods guaranteed or money refunded.

JOHN B. STAM & CO.,
Manufacturers of Ford Specialties,
1789 Broadway, New York.

AUTOMOBILE SURPLUS STOCK

SYNDICATE, 875 Seventh Ave., N. Y. City.
Phone CO. 4044. Near Carnegie Hall.

20,000 SPARK PLUGS

Mosler Red Tag, genuine platinum point.
Retail price\$2.50
Our price69
50c. each, in hundred lots, larger quantities in proportion.

BERGDOLL REPAIR PARTS

The repair business of the Bergdoll cars, together with all drawings, jigs, patterns, etc., has been purchased by us.

We have a complete stock of repair parts for all models on hand, and orders for parts for Bergdoll cars should be placed with us direct to save time.

Louis J. Bergdoll Motor Co.,
124 N. 3d St., Phila., Pa.

BALL AND ROLLER BEARINGS

All Types and Sizes.

We also repair or exchange all makes of ball bearings.

THE GWILLIAM CO., 253 W. 58th St., N. Y.,
1314 Arch St., Philadelphia.

COMPLETE "VULCAN PROCESS" OF
Oxy-acetylene welding plants from \$175.00 for the blacksmith and garage plant up to largest made. Torch light weight. No back-firing in ordinary work. Write to-day for our booklet on welding.

VULCAN PROCESS CO.,
25th & University Avenues, S. E.
Minneapolis, Minn.

DETROIT ATTACHABLE FORE DOORS.

FOR EMP, FORD, HUDSON, ETC.

One Piece Aluminum. Easy to put on. Shipped subject to inspection.

DETROIT FORE DOOR CO.,
66 E. Ford St., Detroit.

DOES YOUR MOHAIR AND CANVAS
top leak? Coleman's Waterproof Filler will make it rainproof. It will not stiffen or change the color. Virginia Waterproofing Corp., Arcade Bldg., Norfolk, Va.

FORD BODIES

Brand new 1914 Ford Touring Bodies...\$100.00
Brand new 1914 Ford Torpedo Bodies... 55.00
Brand new Panel Ford Delivery Bodies. 135.00

Touring and Torpedo Bodies are complete with top, but without windshield. If shield is desired \$8.50 extra.

ERWIN GREER & COMPANY
1456-64 Wabash Ave. Chicago.

FORD OWNERS AND DEALERS

You will save trouble and money by installing our time elevating device.
Ford Parts Specialty Co.,
1211 Main St., Richmond, Ind.

FORD OWNERS.

K. W. MASTER VIBRATORS
Reg. Price—\$15.00. Our Price—\$12.50.
Latest type with kick switch
Do you want our catalogue?

THE M. & M. COMPANY
CLEVELAND'S LARGEST SUPPLY HOUSE
480-500 Prospect St., Cleveland, Ohio.

FORD OWNERS—TOWNSAN VALVE AD-
justers are the simplest, surest and lightest silencers in the world. \$1.50, postpaid. Townsan Auto Spec. Co., Mitchell, S. D.

FORD OWNERS

Atlas Valve Remover, specially designed for Ford Cars. Send \$1.00, we ship Parcel Post. ATLAS MACHINE CO., PROVIDENCE, R. I.

FORD OWNERS—WE CAN MAKE YOUR
car the easiest rider made with light or heavy load; no jolts, no jars, no upthrow. Write us. Thomas Auxillary Spring Co., Canisteo, N. Y.

FORE DOORS.

We are prepared to make prompt shipment from stock and guarantee the doors to fit, or money returned.

F. E. LORTZ CO.,
1237 Michigan Ave., Chicago, Illinois.

FOR QUICK REPAIRS ON ALL MAKES

of Magnetos Give Us a Trial.
Estimates cheerfully furnished.
PELLETS MAGNETO EXCHANGE,
1463 Michigan Avenue, Chicago, Illinois.

FOR SALE—22-HP. 3-CYLINDER KNOX

Marine Engine with reverse gear, bronze shaft and propeller. First-class condition. Price \$200.00. Portland Garage Co., 49 Cross St., Portland, Me.

Results That Count

Autoparts Mfg. Co.,
Detroit, Mich.

The Automobile,
239 W. 39th St.,
New York City.

Gentlemen:—Your columns certainly pulling. So many orders ahead for Ford N-R-&S radiators that we must cut out advertising.

Yours very truly,
Autoparts Mfg. Co.,
F. J. Niedermiller,
Secretary.

FOUR (4) GUARANTEED SPARK PLUGS

for \$1.00.

J. C. BROWN,
19 Dorrance St., Providence, R. I.

GUARANTEED RADIATORS.

Not always necessary to buy new radiators. New cores can be furnished for frozen or damaged radiators.

We build the fin and tube type. Guaranteed copper fins and tube.

Ford Model T core	\$14.00
Ford R. S. & M.	23.00
Hupmobile 20	23.00
Hupmobile 32	20.00
Warren 30	25.00
Warren 40	30.00
E. M. F., Patterson, Cole 30.....	30.00
Flanders 20, Paige 1912	25.00
Buick 10, 14, 32 and 33	25.00
Buick 16, 17, 18, 19, 21, 26, 27.....	30.00
Hudson 20	25.00
Hudson 33, Cadillac 30.....	30.00
Paige 1910, 1911	23.00

The above is the price of cores only. Where casings are damaged beyond repair, add \$5.

All our work guaranteed absolutely new—built to your order.

Do not be misled; cores cannot be rebuilt. Write for price on radiators not mentioned in above list.

HURON RADIATOR & LAMP COMPANY,
253-255 Jefferson Avenue,
DETROIT, MICHIGAN.

Terms cash with the order.

AUCTION**AUCTION**

MICHIGAN BUGGY CO. SOLD AT LAST
THIS TREMENDOUS STOCK TOOK
NEARLY TWO WEEKS TO SELL

WE BOUGHT THE SUPPLIES
AND ARE GOING TO SELL AT HALF
WHAT THEY COST TO MAKE

194 Demountable wheels less hubs, per set of 4	\$8.00
300 Firestone Q. D. demountable rims each	1.75
Lewis full floating shaft drive rear axles with hubs, drums, and bearings, complete.....	55.00
34 Sets Rear Tire Brackets.....each	2.00
1 Four cylinder Mitchell motor, 35 Hp.	135.00
3 Four cylinder Oswald motors....	100.00
6 Six cylinder Herschell-Spillman motors	275.00
Flywheel starter gears.....	2.00
Four cylinder Midland crank shafts	15.00
1000 Running Board Hangers.....	.35
400 Full Elliptic scroll springs...each	2.00
300 ¾ elliptic scroll springs.....each	2.50
600 Full elliptic springs.....each	1.50
Four cylinder motors, Ohio type, new	75.00
Sliding gear transmissions.....	50.00
Cone clutches	20.00
Michigan bodies, upholstered and painted, with fenders, mud apron and hood.....	100.00
Spitfire spark plugs, type C.each	.25
Vesta electric lighting outfits with ampmeter	25.00
Briggs Magneto with coil.....	18.00
Atwater-Kent Unisparker, four cylinder	19.00
Jones speedometers, \$25.00 list...	10.00
Pressed steel frames with hangers and springs	15.00
20 F-A-L Shaft drive rear axles, I-beam, front with hubs for 3,000-lb. car	40.00
500 ft. 1½" radiator hose.....per ft.	.15
500 ft. 2" radiator hose.....per ft.	.18
10 Midland 5-passenger bodies, lat- est type, not upholstered.....	25.00

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WE CAN SUPPLY REPAIR PARTS FOR
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Rear axle shaft and flange...each	5.00
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Complete parts to build a Mighty Michigan
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AUTO PARTS CO.

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HAVE YOU TRIED THE NEW COTTER-
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Brightens and renews the finish on all
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Platinum Pointed
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Platinum Points
Write for list

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'JIFFY' SIDE CURTAINS FOR FORD CARS
Everything complete ready to attach to
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We have on hand a complete stock of re-
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IMPORTANT NOTICE to THOMAS OWNERS.

We can supply you promptly all parts of
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We are headquarters for the remodeling
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Prices consistent with good workman-
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Special prices on Limousine and Landaulet
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IS YOUR FORD CAR SAFE?

No, it is not
Without Cranklock.
Don't wait. Write to-day.

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PEERLESS EXTRA FINE BLACK BAKING JAPAN

Bakes to either a high gloss, egg-shell
gloss or dull finish on all metal parts of au-
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dealer.

THE COLUMBUS VARNISH CO.,
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Having purchased all necessary parts to
maintain the best service on Michigan Cars,
we are about to issue a reduced price list;
all owners of Michigan Cars will be bene-
fitted by sending application, giving name,
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at once.

PHILADELPHIA MACHINE WORKS,
61 to 71 Laurel St.,
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MORA REPAIR PARTS.

We have purchased the repair business of
the Mora cars, including all stock on hand,
drawings, patterns, jibs, office records and
the right to receive the mail of the Com-
pany.

Owners of Mora cars will save consider-
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directly with us. We have in stock repair
parts for all models.

PHILADELPHIA MACHINE WORKS,
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MAGNETOS AND COILS AT REDUCED
prices. All makes repaired on short notice.
Work absolutely guaranteed.
C. Kottmann, 1876 Broadway, New York.

NEW FORD TOURING CAR BODY WITH
top and side curtains, complete, painted,
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Save \$25 to \$75 by doing the work at home
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ARSENAL VARNISH COMPANY
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The finest air drying black enamel for all
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kinds of metal or wood. Dries with a gloss
finish. Ask your dealer.

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RADIATORS THAT COOL THE MOTOR
and give satisfaction are W(RIGHT). Built
for all cars. We have in stock—
Ford T. and all Buick models.
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MERCER RACEABOUT 1912
for sale, perfect condition
guaranteed, run 3000 miles.
Equipped with Warner 100-mile
speedometer, two spare tires,
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Inquire A. J. Major, Vaudreuil
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in U. S.).

The Automobile:
Gentlemen:
Do not repeat the above adver-
tisement as I have so many inquiries
that I will need a secretary soon.
Yours truly,
A. J. MAJOR.
Vaudreuil Station, Que., Canada.

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The Detroit Radiator is guaranteed to give
satisfaction. It insures perfect cooling, won't
break thru freezing, and is the strongest and
best radiator for replacement purposes.

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Ford T (special construction).....	\$20.00
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Prompt delivery on special radiators.

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PEERLESS JET BLACK FENDER JAPAN

A rich black enamel to finish fenders of
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RADIATOR COVERS
Full stock for all cars.
Prompt shipment.
Ford covers, \$1.40; other cars, \$2.50.
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REDUCE YOUR GAS BILL 25%

By Using The SCUDDER GAS SAVER.
Here's your opportunity. Write for particu-
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IF YOUR OLD CARBURETOR IS NOT
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FOR OUR NEW MODEL L.
SEND FOR OUR EXCHANGE PROPOSI-
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SHINAUTO, THE GREAT PRESERVER.

Keeps Autos like new without washing.
Prevents cracking and checking of varnish.
Makes old cars like new. Guaranteed. Saves
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Trial can, 50c. by mail. Enough for 2
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SPECIAL ATTENTION GIVEN TO RE-
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description. No matter how badly damaged
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serve as new at a great saving of cost. Miss-
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We sell new lamps, radiators, bumpers,
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Nickel, silver and brass plating and enam-
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We always have bargains on hand.
Write for particulars. Estimates given.
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SPECIAL BARGAINS

Warner transmissions, new, 3 speed,
selective, \$50.00 each. Warner transmissions,
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Fans, \$2.00 each.

Auxiliary seats, unupholstered, \$8.50 per pair.

Splitdorf magnetos, 4 cylinder, new, \$16.00.

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Rutenber motors, model 27, 4 cylinder, 3%
x 5 1/4 complete with fan, starting crank, mag-
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PEERLESS CYLINDER ENAMEL

Will finish the metal parts a smooth black
finish which will not be affected by heat,
grease or gasoline. Ask your dealer

THE COLUMBUS VARNISH CO.,
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SPECIAL TO DEALERS

B Prest-O Tanks, full of gas, all O. K.,
\$10.25; only a few left. Style E, full of gas,
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TOURING, ROADSTER, RACING BODIES.
Seats, Special and Stock Sizes. Radiators,
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For dusting and polishing automobile bodies, windshields, lamps, pianos or any other polished surface.

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TURNTABLES.

For Private and Public Garages.

A ready solution for congestion in the garage.

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Manufacturers of Portable (weight 40 lbs.) and stationary, welding, cutting or lighting plants. Supplies of all kinds. Agents wanted. Fulton & Enfield Sts., Bklyn, N. Y.

USE AN AIR-FRICTION WITH new 1914 improvements. Increases power and economy of motor one-half. Absolutely impossible to choke or load like other carburetors. Uses distillate, gasoline or half kerosene with finest results. Starts easy in coldest weather. We fit all motors, guaranteeing definite results, or refund money. Exclusive county rights. Special price first order. Liberal exchange on other carburetors.

THE AIR-FRICTION CARBURETOR CO.,
Dayton, Ohio.

WE HAVE JUST TAKEN IN EXCHANGE

2-ton Saurer chassis in fine condition. 4 speed, transmission direct on 3d; 4-cyl. long motor. Bosch high tension magneto. CONDON, 2635 WABASH AVE., CHICAGO.

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The best and most reliable. We are authorized agents and distributors for Witherbee Igniter Co. All makes of storage batteries recharged, repaired and exchanged. Satisfaction guaranteed. Meder-Staudt Co., 1876 Broadway, New York City.

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For Free Samples of
Electro-Nickel Powder
for plating Automobile Trimmings. Will put on as heavy a coat of metal as an electro-plating bath.

50 NEW PRESSED STEEL FRAMES 163" long, 34" wide. Each, \$10.00. Send for sketch.

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\$690.00 PLUS \$3.00

You pay \$690.00 for your Ford and take the risk of its being stolen. Cranklock costs \$3.00 and safeguards your car. Write personally.

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WANTED—A NEW OR SECOND-HAND transmission for a Model J, 1909 Mitchell car; give details and price in first letter. Madalin Garage, Madalin, N. Y.

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AJAX AUTO SHEET METAL PARTS Mfg. Co. Radiators repaired. Brazing, welding and pipe work. 38-40 W. 62d St New York.

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AUTO CASINGS RETREADED AS FOL- lows: 30x3, \$6; 30x3½, \$7; 32x3½, \$7.75 34x4, \$12; workmanship, material and price right; a trial will convince. Jungkind & Vogler, 158 Chambers St., N. Y. City. Repairing tires since 1896.

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and fitted with my new light racing pistons, guaranteed to give 35% higher speed, power and economy. Also make gears of all kinds and push rods and piston pins of chrome nickel steel, hardened, tempered and ground, superior to factory; also cranks, connecting rods, crank cases or any part, and make special motors; send parts to the shop of quality.

McCADDEN MACHINE WORKS.

St. Cloud, Minn.

Results That COUNT

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New York

The Automobile,
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New York City.

Gentlemen:
From our six line advertisement in your Classified Section we received inquiries from all parts of the United States including orders for approximately Six Hundred "Goodman Tire Shields."

We are now placing an advertisement in your display department so that we may show a cut of our "Goodman Tire Shields." Thanking you for the excellent results, we remain,

Yours very truly,
Approved Auto Specialties Co.
JOHN B. BRANDRETH.

CYLINDERS REGROUND

and fitted with new pistons and rings for \$15 per cylinder. We make parts and cut gears of all kinds. Send us your old parts and we will repair or duplicate them in record time. Cracked cylinders, gear cases, etc., welded and made good as new. Aluminum, bronze and brass castings of every description. The Adapt Machinery Co., 1626 Wabash Ave., Chicago, Ill.

CYLINDER REGRINDING AND OXY-

Acetylene Welding are lines in which we excel. Wrist pin scores repaired, \$12—bore not enlarged—no new pistons required. We are an old, experienced and responsible firm—ask Dun or Bradstreet. Quotations and full information cheerfully given.

WATERBURY WELDING CO.,
Waterbury, Conn.

FORD**CYLINDER GRINDING**

New Pistons, Rings, Pins.

Our special equipment for grinding Ford Model T. cylinders enables us to fit new pistons, new rings, and piston pins on short notice. A complete job better than new at prices that will interest Ford dealers as well as owners.

Write at once to

AUTO ENGINE WORKS,
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HAVE YOUR CYLINDERS REBORED AND ground, fitted with new pistons and rings by up-to-date factory methods. Price for four-cylinder motor, not over 4½" bore, \$45.00; other sizes reasonable.

Starbuck Automobile Co.,
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RADIATORS, LAMPS, MUD-GUARDS, GAS and Oil Tanks manufactured and repaired. Also all kinds of Sheet Metal Works. Standard Auto Parts Metal Works, 1691 B'way, N. Y.

STORAGE BATTERIES, SHIP YOUR OLD batteries to the manufacturer for repairs. Send for Catalogue K. Essex Storage Battery Co., 272 Halsey St., Newark, N. J.

TOPS, NEW OR RECOVERED; CUSHIONS and Backs, new or recovered; Carpet Rugs; Curtains; Dust Covers, etc. W. H. Newton & Son, 125 Elm St., Cortland, N. Y.

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ARE YOU LOOKING FOR A PROFITABLE and safe investment in an established business, one that will bear closest investigation. If so, send a postal to J 314, care The Automobile.

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Complete business of motor truck manufacturer, fully equipped machine shop, new trucks, used trucks, trade mark, good will and agency contracts; will warrant investigation; price reasonable; running now. Apply Box J121, care The Automobile.

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Established eight years, agency for MAXWELL, REO, CHALMERS. Sold 70 cars in 1913. Owner got other interest. Will sell right. A great opportunity to get in the auto business. Write
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MAN WITH MECHANICAL EXPERIENCE and executive ability wants active connection with established manufacturing concern; one manufacturing auto accessories preferred; can invest \$5,000.00 if desired. Address Box G811, care of The Automobile.

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22 complete chassis, a \$2,500.00 car, Timken axles, Wheels, Radiator, Hood, Fenders, Body, etc., all ready for 4 or 6 cylinder engine and transmission; also 28 American Ball-bearing axles and frames, latest designs; also \$25,000.00 other auto parts, lathes, drills, etc., will sell one or all. Address 1448 Elmwood Ave., Lakewood, Ohio.

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We have some wonderful bargains in brand new model "X" Splitdorf magnetos especially reduced from \$75 to \$25, complete with coil. Also a large number of other magnetos at wrecking prices.

Send for our PRICE WRECKER, the money saver.

TIMES SQUARE AUTOMOBILE COMPANY,
WORLD'S LARGEST DEALERS,
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MAGNETOS, BOSCH AND MEA, BOUGHT, sold, exchanged; best bargains.
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ALL KINDS OF AUTOMOBILE PARTS welded; cylinders, crank cases, frames, brass and steel parts our specialties.
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WELDING.

Cast Iron, Aluminum and all metals.
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"THE WELDING CO.,"

SPRINGFIELD, BOSTON, HARTFORD, Holyoke, Bridgeport, Salem, Aluminum Cases and Cast Iron Cylinders a specialty. Five Shops with Five Years' successful experience. Ask for our printed Guarantee.

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CHAUFFEUR, MARRIED, GOOD MECHANIC wishes position. Joseph Pleva, 118 New York City.

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HIGH GRADE AUTOMOBILE MEN. Applicants and employers write us concerning available positions in every branch of the industry. The Toledo Engineering Agency, Toledo, O.

WANTED.

A man who can do autogenous Welding and Automobile work. Good salary to the right man; no booze artist; wide open town, healthy climate.

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Sales Engineer—Manufacturer of electric starting and lighting system and automobile lamps wants two salesmen. Must be engineers acquainted among manufacturers. Salary, commission and expenses. Address Box J229, care of The Automobile.

WANTED—SALESMEN TO SELL OUR guaranteed auto tire liners, double locks, inner and outer shoes, and other accessories. Liberal commission and exclusive territory. Write today.

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REPRESENTATIVES WANTED FOR UN-assigned territory to sell Olympic Electrical and Mechanical Auto Horns. The newest, best and cheapest. The only horn on the market with a three-year guarantee. Exclusive territory to right parties.

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WANTED—AGENTS. TO SELL JIFFY Auto Curtains in unallotted territory Address Hercules Rubber Co., (Jiffy Curtain Division), 2 Hudson St., New York.

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AN AMERICAN COMPANY ESTAB-lished in Johannesburg and other cities in South Africa desires to arrange agencies to sell automobiles—both gasoline and electric. Address Box J 520, care of Automobile.

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Big Reduction in Non-Skid Tires. We are carrying the following sizes at a big reduction to owners. Here is your opportunity to buy non-skid tires at a nominal cost.

Size	Price	Size	Price
30x3 1/2	\$14.50	34x4	\$22.50
32x3 1/2	16.00	36x4	24.50
32x4	20.00	34x4 1/2	27.00

I will ship any size tire listed above to any part of the U. S. upon receipt of 10 per cent. of order, balance C. O. D.

M. C. MORAN, 334 Amsterdam Ave., New York City.

I WILL SELL YOU CLINCHER OR straight side tires, either firsts or seconds, cheaper than any one in the United States.

D. OGDEN, Columbus, Ind.

AUTO TIRES GUARANTEED 5000 MILES

as follows: If a tire fails to run 5000 miles we replace with another for one-half the price marked below. Lowest prices.

Size	Tires	Tubes	Size	Tires	Tubes
28x3	\$7.45	\$2.25	33x4	\$14.85	\$4.17
30x3	8.75	2.30	34x4	15.95	4.29
30x3 1/2	10.00	3.12	36x4	17.85	4.50
32x3 1/2	11.95	3.28	34x4 1/2	19.95	4.71
34x3 1/2	12.20	3.50	35x4 1/2	20.50	4.71
30x4	12.75	3.84	36x4 1/2	20.90	5.60
32x4	13.90	4.05	37x5	24.70	6.66

On C.O.D. orders we require 10% deposit. AKRON TIRE COMPANY, INC. 1612 Broadway, New York City, Cor. 49th St.

ONE FORD OWNER

In every town, to act as agent for the extra heavy STODDARD TIRES made especially for Ford Cars.

You can save on your own tires and make a good profit in spare time. Write at once to nearest branch.

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Write for prices on tires. ANGLO TIRE CO. 237 W. 49th St., New York City.

Results That Count

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Yours truly, (Signed) Fred. F. Fiske.

RIMS, RINGS AND RIM PARTS FOR ALL rims made. Send for our rim part catalogue.

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TIRE BILL HALVED.

Thousands saved from the junk heap by OUR RECLAIM SYSTEM.

Send two old tires to be made into one sound tire which will run 2000 miles and more for \$2.50 to \$4.50.

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LOWEST PRICE TIRE HOUSE IN THE U.S. 30x3—\$7.85, 30x3 1/2—\$9.85, 32x3 1/2—\$10.60, 33x4—\$14.50, 34x4—\$15.00. All other sizes. Special prices to dealers.

TIRE SALES COMPANY Buffalo, N. Y.

TIRE BARGAINS

28x3, \$7.20; tubes, \$2.40; 30x3, \$7.85; tubes, \$2.50; 30x3 1/2, \$11.00; tubes, \$3.35; 32x3 1/2, \$12.00; tubes, \$3.55; 34x4, \$17.25; tubes, \$4.60. Tubes guaranteed. Other sizes accordingly. Get price list. 10% with order, balance C. O. D. Examinations allowed.

PARA AUTO TIRE CO., 1415 Michigan Ave., Chicago.

TIRES GUARANTEED 3000 MILES.

We have a complete stock and can make immediate delivery on all orders and all sizes. We ship all tires with privilege of examination, and require no deposits whatsoever. If the tires are not as represented, return to us at our expense.

SIZE	TIRES	TUBES	SIZE	TIRES	TUBES
28x3	\$6.69	\$1.93	34x4	\$15.80	\$3.65
30x3	7.50	2.03	35x4	16.20	3.73
30x3 1/2	9.93	2.68	36x4	17.01	3.86
31x3 1/2	10.13	2.72	32x4 1/2	16.75	3.86
32x3 1/2	10.53	2.76	34x4 1/2	18.44	3.86
34x3 1/2	11.55	2.84	35x4 1/2	19.04	3.89
30x4	13.17	3.13	36x4 1/2	20.87	4.26
31x4	13.45	3.13	37x4 1/2	21.28	4.34
32x4	13.77	3.21	36x5	23.49	4.67
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THESE TIRES ARE BRAND NEW AND NOT RECOVERED STOCK.

We have also on hand 5000 United States guaranteed tubes. Every tube is absolutely fresh stock, and we are selling them at 50c. on the dollar. Order at once and take advantage of this unequalled offer before it is too late.

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3500 ACTUAL MILES GUARANTEED!!!

IT'S RESULTS THAT COUNT!!

Our Tires give between 3500 and 5000 miles. Hundreds of Satisfied Customers. Fresh clean stock in every size. Actual Guarantee of 3500 Miles—Your Money's Worth!

YOUR CHOICE OF ANY NON-SKID TREAD

	Plain	Non-skid	Plain	Non-skid
28x3	\$7.00	.....	35x4	\$15.50...\$22.00
30x3	8.00	.....	36x4	16.00... 22.75
30x3 1/2	10.00	\$13.50	37x4	16.50... 23.00
32x3 1/2	10.65	15.50	34x4 1/2	19.00... 23.50
34x3 1/2	11.25	16.50	35x4 1/2	19.50... 24.50
32x4	14.50	19.00	36x4 1/2	20.00... 25.75
33x4	14.75	20.00	37x4 1/2	20.50... 26.00
34x4	15.00	21.50	35x5	19.50... 24.50

Other sizes. Send for our Catalogue. Prompt Shipment. Orders filled same day received. C. O. D. Shipments marked "Subject Examination" to any part of the Country if 10% accompanies order.

Certified Checks, Cash, or Money Orders. References. Security Bank of New York or any Commercial Agency. Send us YOUR order to-day—NOW!

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NEW ENGLAND AUTO LIST AND TOUR-ist includes weekly lists of all N. E. Auto Owners, Garages, Dealers, etc., with maps, selected. N. E. routes and motor news, \$10.00 yearly. 138 Pearl St., Boston, Mass.

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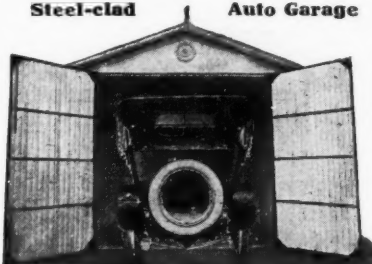


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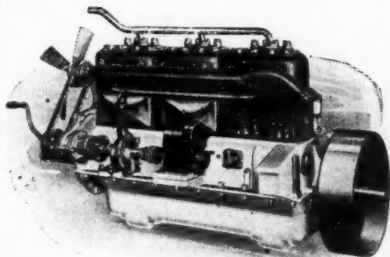
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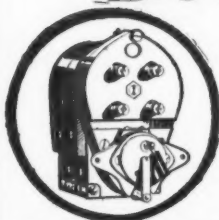
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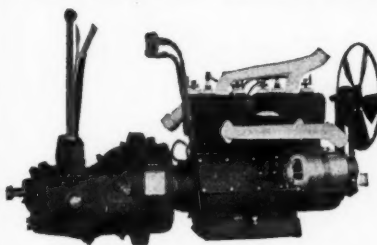


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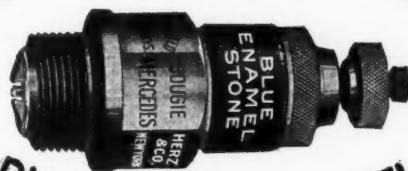
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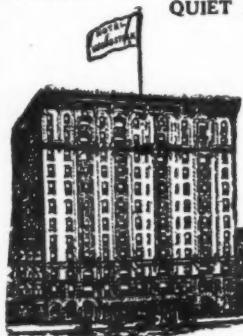
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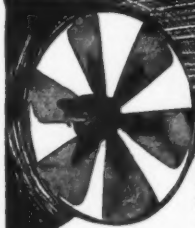
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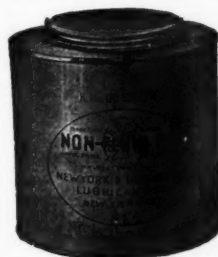
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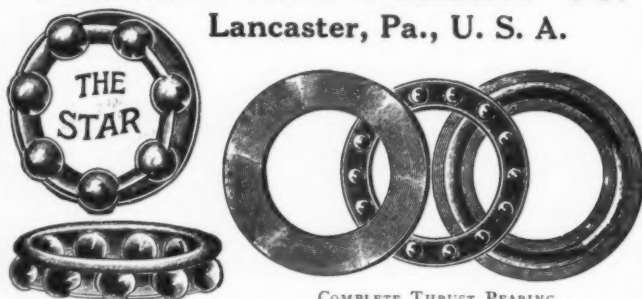
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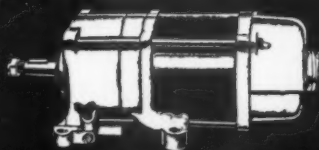
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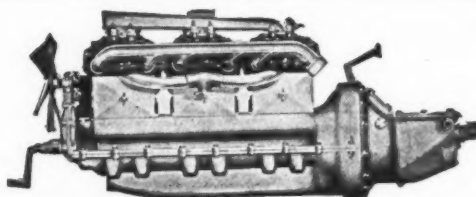
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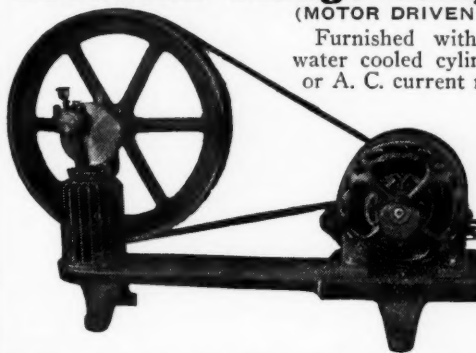
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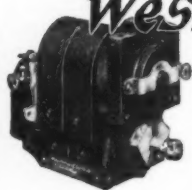
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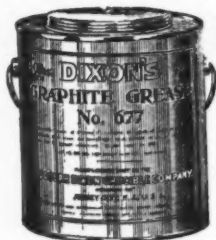
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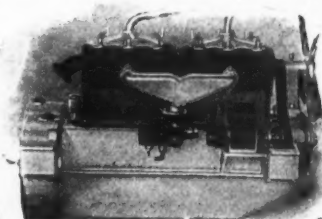
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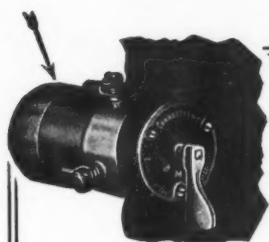
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The "Connecticut" makes starting easy—makes motoring a real pleasure. Easy to install. Fits flush with dash and does not detract from appearance of the car.

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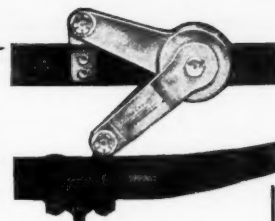
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absorb the jars and jolts which make riding a torture and tire bills a nightmare. Adjust themselves automatically to road conditions and varying weight of load.



Special Ford Shock Absorbers

Real shock absorbers for Ford Cars—not a makeshift device. Exactly the same in every detail as the larger "Connecticut" Shock Absorbers and guaranteed to give service.

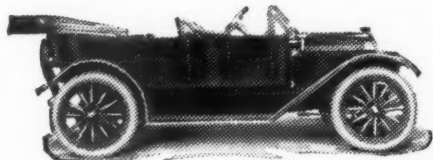
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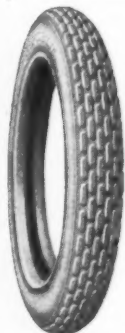
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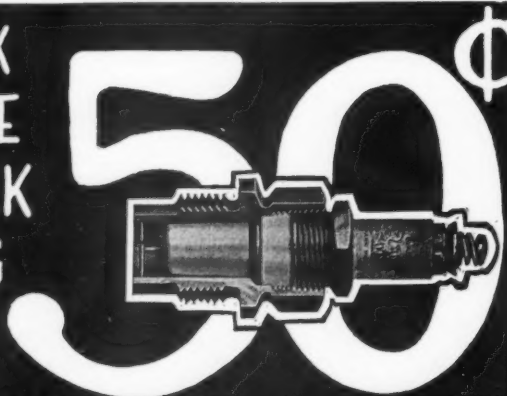
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If you do this your next tires will be Republics.

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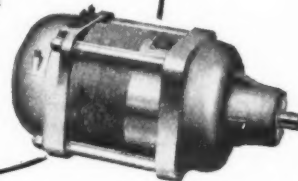
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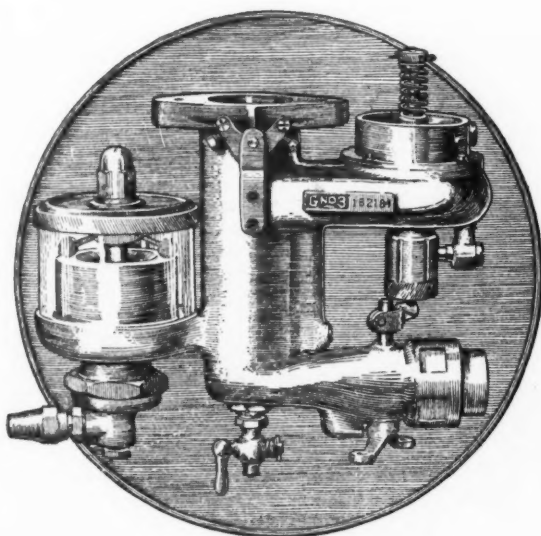
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Three Great Models

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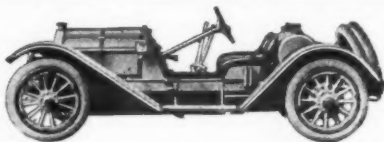
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Six cylinder 65 H.P. Equipped
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**The body of the shell carries
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021

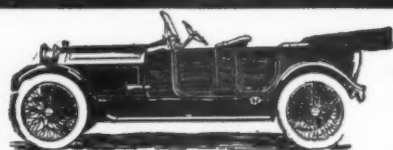
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The Herreshoff six was the first light six built and is today conceded the best example of skillful design in combining strength with reduced weight.

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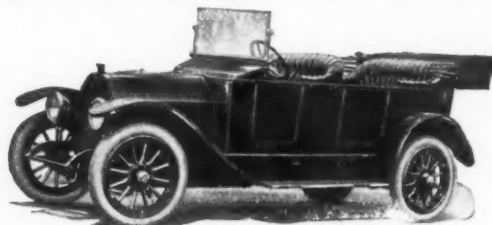
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GENUINE DUFF-BUILT

BARRETT

AUTOMOBILE JACKS

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Description: The adjustable footlift is combined with a standard side rack which is interchangeable. The side rack has perforations spaced one inch apart, into any two of which the toe can be screwed, at any desired height, to suit any difference between front and rear axle heights.

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Other features of the 1914 specifications for BARRETT JACKS are the highest grade malleable iron in Base and Lifts; heat-treated high carbon steels in Pawls, Gears and Pinions; machine-cut teeth in both Gears and Racks and machined pawl points and bearings, minimizing friction and eliminating the slipping of cogs; easy-acting Reversing Lever and a Tire Tool Lever for removal or replacement of tires. Altogether an assemblage of features that stamps the 1914 BARRETT JACKS as the most efficient and most serviceable Automobile Jacks ever put on the market.

Dealers should write at once for quotations and full working information on the Adjustable Footlift, together with full 1914 Specifications

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The Hand Operated Horn



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NO Electrical Wiring
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THAT'S ALL.

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TWO CONNECTING ROOMS WITH BATH

Two persons\$5 to \$8 per day
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does more than eliminate the frequent and troublesome adjustment of the Ford coils.

Atwater Kent Ignition assures perfect synchronization at all speeds, eliminating pre-ignition and overheating—starts easily with a quarter turn of the crank and frequently without cranking by means of the starting button on the coil.



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The Atwater Kent will, in addition, wonderfully increase the power, speed, flexibility and hill-climbing ability of the Ford car, and gives superior results and costs less than half that of the high tension magneto.

It consists of the Unisarker or distributor elevated to a convenient and accessible position which takes the place of the Ford timer and a single non-vibrating coil is installed in place of the four vibrating coils.

It is easily installed by any one who can time a motor—no holes to drill—a screw driver and wrench are the only tools required.

Price complete with hand-operated switch \$28.00—foot-operated switch \$2.00 extra.

Write at once for Circular "A" and trade prices

ATWATER KENT MFG. WORKS.

4938 Stenton Ave., PHILADELPHIA

DUELEC

As Necessary as Spark Plugs

One turn and off she goes. Hot, vaporized gasoline right into the intake manifold.

Better than a dozen ordinary primers combined.

Here's how it works: When the current is turned on, the core (5) is attracted longitudinally in the casing (B) by the magnetic coil (13) a sufficient extent to open the valve (2), whereupon the hydrocarbon (gasoline) will pass from the supplemental pipe (3) past the valve (2) in suitable openings in member (A) on through chamber (B) past or through the core (5) in openings or passages provided in same out of the casing (B) through openings (14) into vaporizing chamber (C) where, coming in contact with resistance wire or band (7), the gasoline is vaporized and thence passes to intake manifold and on into cylinders, ready and in a most favorable condition, for exploding.

THE DUELEC is protected by patents and all infringers will be prosecuted.

MR. MOTORIST—Demand it from your dealer. Or sent upon receipt of \$10.00.

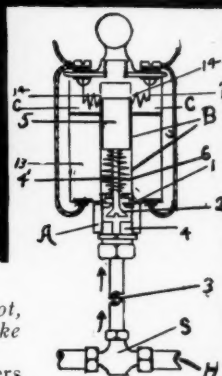
DEALERS—This is one big sales proposition for you to investigate.

To the Manufacturer—Be a leader and include DUELEC as part of your standard equipment. WRITE US—TO-DAY.

U. S. TRAUB

14 North Broadway,

Yonkers, New York



The AMES AUTOMATIC SHOCK ABSORBER

Without the AMES your spring is incomplete

Clarence N. Peacock & Company

1510 Michigan Ave.,
Chicago, Illinois.

Exclusive Licensees
1788 Broadway, New York, N. Y.

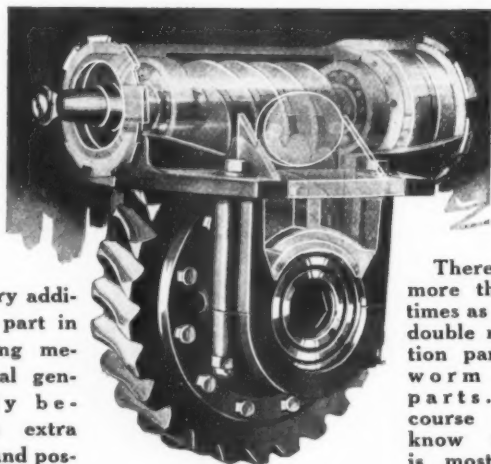
5986 Center Ave.,
Pittsburgh, Pa.



Please mention The Automobile when writing to Advertisers

You build Silence, Neatness, Simplicity and Efficiency into your vehicles when you equip them with the

SHELDON WORM DRIVE



Every additional part in anything mechanical generally betokens extra wear and possibly trouble.

There are more than 3 times as many double reduction parts as worm drive parts. Of course YOU know which is most efficient.

A CHAIN is no stronger than its weakest link. Every nut, cotter, washer, head pin casting, forging, chain link and rivet is a necessary unit of the assembly it composes. The failure of one of those units may mean the wreck of your truck, and perhaps the damage of property and the loss of life.

Only one-third the number of parts required for a Worm Drive that are required for a two-step reduction of the chain driven type. This is convincing proof that, all things being equal, the single reduction Worm Drive has a three-to-one chance of giving better service than a two-step reduction with three times as many parts.

But all things are not equal. The Worm Drive is a single reduction, transmitting the power direct from the motor to the rear wheels. It is the only drive in which it is possible to secure this result.

The Worm Drive conserves power because it is a single reduction. Every moving power transmitting unit works in oil, reducing friction to a minimum.

Sheldon Worm Drive is non-adjustable. The Worm carrier is machined exactly true by specially constructed machines.

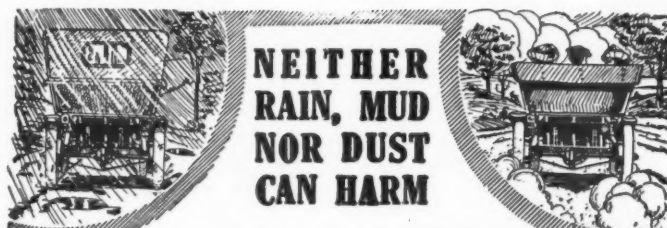
If the carrier is not true, the Worm can not be assembled. Once assembled the Worm and Worm Wheel can be removed and replaced without disturbing their alignment. No adjustment to tamper with.

It is not necessary to provide adjustment for wear. The slight wear of the imported Worm and Worm Wheel only adds to its efficiency.

Of course, the Worm and Worm Wheel wear out, but not during the life of one truck. The experience of the largest user of Worm Drives has proven this.

Sheldon Axle Company
Wilkes-Barre, Pa.

CHICAGO.....68 E. 12th Street
SAN FRANCISCO.....444 Market Street
DETROIT.....1215 Woodward Avenue



**NEITHER
RAIN, MUD
NOR DUST
CAN HARM**

your luggage when it is
carried in the new rain-proof, water-proof

KAMLEE AUTO TRUNK

"Made by trunk-makers who are motorists"

Embodies every desirable feature—strength, lightness, durability, beauty. It adds to rather than detracts from the appearance of any car.

Consider these exclusive Kamlee features before you buy an auto trunk, then you'll surely select a Kamlee: patent drop front—no lifting of lid—patent interlocking edge makes it air-tight, dust-proof, rain-proof; no straps to bother with in opening; fitted with standard suit-cases permitting removal of one party's luggage without disturbing others.

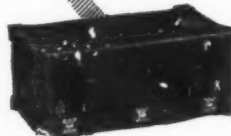
Ask Your Dealer or write us for price and descriptive circular. If your dealer can't supply you, we'll gladly ship you a Kamlee on approval.

The Kamlee Co.

236 Broadway

Milwaukee, Wis.

Look for
The Red and Gold
Diamond
In Lower
Right Hand
Corner



"WARNER GEARS—Standard For Years"

We shall exhibit a complete line of our product at both the New York and Chicago 1914 automobile shows.

NEW YORK

Grand Central Palace—C 31

CHICAGO

Coliseum Gallery—43

WARNER GEAR CO.
—MUNCIE—IND.—

DETROIT OFFICE — 628 FORD BLDG.

LAST CALL

To Advertisers Who Will Use Space in the
JANUARY 1st
Show Issue of

***THE* AUTOMOBILE**

All copy and cuts must reach us not later than Monday,

DECEMBER 29

Act Now and Put Your Advertising Before the Really
Vital Purchasing Power for Products of the Automobile
and Motor Truck Industry. This includes

*Car Owners—Prospective Car Owners, Dealers, Engineers and Manufacturers: Send Your Order
with Copy and Cuts—and Do It Today*

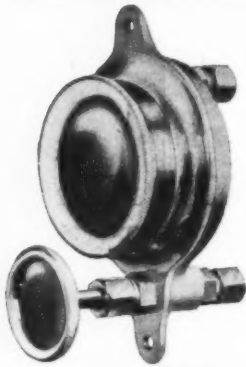
THE BIG FIVE

MERCHANDISING NUMBERS

Jan. 1st New York Show Advance Issue
Jan. 8th New York Show Resume Issue
Jan. 15th Big International Editions
Jan. 22d Chicago Show Advance Issue
Jan. 29th Chicago Show Resume Issue

THE CLASS JOURNAL CO.

239 W. 39th St., NEW YORK



Start Your Car With One Turn of the Crank With

The WEBB JAY Automatic SUCTION PRIMER

It Automatically Refills Itself

Our Primer refills itself automatically by suction. The primer is 2½ inches in diameter, heavily nickel-plated and an ornament to any dash board. The sight-feed attracts the attention of every automobile owner and permits the motorist to know exactly how much gasoline is going to his cylinders.

This primer saves time, labor, money, and temper. It is inexpensive and everlasting, simple in operation, easy to install, and infallible if used according to directions.

It greatly increases the efficiency and insures the perfect operation of all self-starters, whether electric, air or mechanical. Any chauffeur, mechanic, repair shop or factory can easily install it.

PRICE, COMPLETE WITH FITTINGS AND PIPING, \$6.00

Full directions for installation accompany each primer

At all dealers, or direct on receipt of price. Some territory still open to agents

The Motor Devices Co., 2635 S. Wabash Ave., Chicago, Ill.

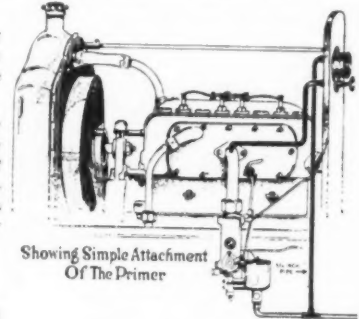
New York Representative, ASCH & COMPANY, 1779 Broadway

How to Operate the Primer

To get the best results from this primer follow these directions: "When stopping motor, open priming valve wide; then pull switch plug. Then close priming valve."

This results in a rich priming charge being drawn into the cylinders which remains there ready for the next start.

This device is protected by letters patent which broadly cover the basic principle of automatically priming by engine suction. **Infringers will be vigorously prosecuted.**



Showing Simple Attachment
Of The Primer

American-Made-for-American-Trade

NEW DEPARTURE GUARANTEED BALL BEARINGS

To facilitate supplying demand of garages, dealers and owners, for New Departure ball bearings, the following distribution agencies are announced, where stock of these bearings is carried:

Ahlberg Bearing Co. 93 Mass. Ave., Boston, Mass.
Pruyn & Bilodeau. 1550 River St., Hyde Park, Boston, Mass.
Ahlberg Bearing Co. 1790 Broadway, New York City
Jos. C. Gorey & Co. 352 W. 50th St., New York City
The Gwilliam Co. Broadway & 58th St., New York City
Pruyn & Bilodeau. 1876 B'way, Cor. W. 62d St., N. Y. City
Albany Hdwe. & Iron Co. Albany, N. Y.
Syracuse Rubber Co. 212 S. Clinton St., Syracuse, N. Y.
Iroquois Rubber Co. 279-283 Washington St., Buffalo, N. Y.
Rochester Rubber Co. 24 Exchange St., Rochester, N. Y.
The Gwilliam Co. 1314 Arch St., Philadelphia, Pa.
Bumiller-Remellin Co. 432 Main St., Cincinnati, Ohio
Cray Bros. 1111 West 11th St., Cleveland, Ohio
Hearsey-Willis Co. Indianapolis, Ind.
Machinists Supply Co. Pittsburgh, Pa.
Ahlberg Bearing Co. 2637 Michigan Ave., Chicago, Ill.
Chicago Pulley & Shafting Co., 22-36 S. Clinton St., Chicago, Ill.
Herring Motor Supply Co. 912-14 Locust St., Des Moines, Ia.
Faeth Iron Co. 1125-31 West 8th St., Kansas City, Mo.
Pence Automobile Co. 800 Hennepin Ave., Minneapolis, Minn.
Fred Campbell. 1109 Locust St., St. Louis, Mo.

Elyea-Austell Co. Atlanta, Ga.
The Lininger Implement Co. 6th & Pacific Sts., Omaha, Neb.
Denver Auto Goods Co. 1600 Broadway, Denver, Colo.
Fry & McGill. 16th & Broadway, Denver, Colo.
M. L. Foss. 1729 California St., Denver, Colo.
Bertram Motor Supply Co. 251 South State St., Salt Lake City, Utah
J. W. Leavitt & Co. 301 Golden Gate Ave., San Francisco, Cal.
Irvin Silverberg & Co. 541 Van Ness Ave., San Francisco, Cal.
Kimball-Upson Co. 609-11 K St., 608-15 Oak Ave., Sacramento, Cal.
Western Rubber & Supply Co. 1011 S. Olive St., Los Angeles, Cal.
Western Rubber & Supply Co. 66 South Fair Oaks Ave., Pasadena, Cal.
Western Rubber & Supply Co. 1364 Fifth St., San Diego, Cal.
Ballou & Wright. Seventh & Oak Sts., Portland, Ore.
Ballou & Wright. 817 E. Pike St., Seattle, Wash.
Child, Day & Churchill Co. 1215 First Ave., Spokane, Wash.
Automobile Supply Co. Tacoma, Wash.

Please mention The Automobile when writing to Advertisers

BUYERS already are rushing to see the new

Borland Electric with the Worm-Bevel Gear. Easily the most important ever made in any electric automobile. An absolutely noiseless rear axle; greater power impetus; immensely increased comfort; longer life for the car.

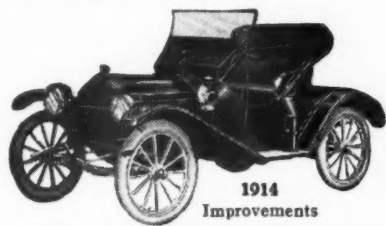
The Borland Electric Worm-Bevel Drive

THE BORLAND-GRANNIS COMPANY
310 East Huron Street, CHICAGO, ILL.

DEALERS who handle the Borland Electric now

are sure to profit. Some desirable agency territory is still open. Yours perhaps. Why let some rival beat you? Write or wire today for details of our agency contract and discounts to dealers.

METZ "Twenty-Two" Roadster



1914 Improvements

THE GEARLESS CAR
"No clutch to slip—no gears to strip"

\$475

Completely Equipped

Center control, left-hand drive, 4-cylinder 22½ H.P. water cooled motor, Bosch magneto, standard artillery wheels, best quality clincher tires, extension top, wind shield, five lamps, gas generator, tools, etc. Makes 5 to 50 miles per hour on the high speed, 28 to 32 miles on 1 gal. of gasoline, and is a wonderful hill climber. A strong, reliable, stylish, fully guaranteed car. You can secure EXCLUSIVE SALE in your territory. Write at once for Book "J" and particulars.

METZ COMPANY

WALTHAM, MASS., U. S. A.

YOUR MOTOR IF PROPERLY LUBRICATED

REQUIRES LESS GASOLINE TO RUN IT. LASTS IN GOOD ORDER MUCH LONGER. GIVES NO TROUBLE FROM CARBON DEPOSITS.

USE

AUTOLINE OIL

TRADE MARK.

MADE FROM PREMIUM PENNSYLVANIA CRUDE AND SECURE

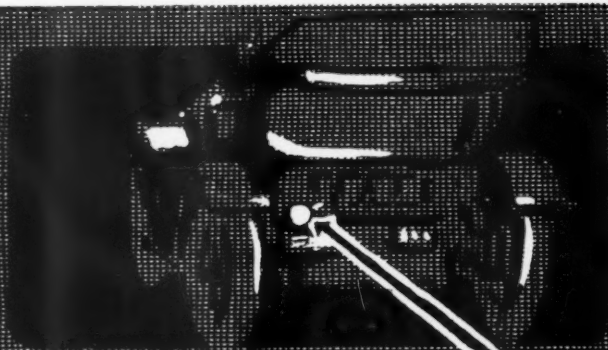
THE BEST POSSIBLE LUBRICATION

Wm. C. Robinson & Son Co.

REFINERY, CORAOPOLIS, PA.—MAIN OFFICE, BALTIMORE, MD.

BRANCHES:

NEW YORK, BOSTON, PHILADELPHIA, CHICAGO, PITTSBURGH, AND IN TEN OTHER CITIES.



SUPPOSE IT FAILS?

Suppose you were on a pitch dark road—and your tail light went out without your knowledge? Suppose behind you came a big seven passenger car on a joy ride —. Don't let it happen to you.

The Rear Light Alarm Will Warn You

If your light goes out. If a filament or bulb breaks. If the connections are faulty or wires broken, the buzzer on the REAR LIGHT ALARM is set in operation. It buzzes loudly and incessantly until the trouble is remedied. It's the watch dog of your tail light. Made of the best materials—tested for accuracy at the factory and guaranteed for the life of your car. Your dealer carries it.

If not, we'll ship it postpaid on receipt of price.

For oil lights, \$3.50. For electric lamps, \$5.

Outfit to change oil light to electric with instrument, \$10.

WRITE FOR OUR CATALOG

Dealers wanted to handle this live accessory. Write us.

The Guaranteed Specialties Co. Kinney Building
NEWARK, N. J.

Starts — Lights — Ignites

REMY

Six Volt System—Does-It-All

AFTER inspecting the new cars at the coming Automobile Shows, you will insist on Remy equipment, not simply because it will crank engines, light the car or fire the engine, but BECAUSE:

This apparatus is designed by O. F. Conklin, the recognized authority on electrical apparatus for motor cars.

This apparatus is built under the factory management of *Men Who Know*.

The responsibility of the complete electrical apparatus is assumed by one reliable, experienced company.

A country-wide system of quick and efficient service is available for Remy users.

We are the only concern building the complete apparatus, either as a whole or in any combination—starting motor—lighting equipment—magneto, or magneto type battery ignition (generator and storage battery.) (The starting and lighting equipment is sold only to motor car makers.)

Write for our magneto (any make) exchange offer.

Remy Electric Company

General Offices and Works, Anderson, Indiana

BRANCHES:

New York Detroit Kansas City Minneapolis
Boston Chicago San Francisco

(Service stations throughout the country)

Vital Facts that the

YOU won't be able to find out all you ought to know about a car from looking it over at the show, for there are certain factors of the most vital importance to every prospective car purchaser that will not be a part of the exhibits.

We mean the capitalization—the indebtedness—the plan of organization and the financial policy of the company building the car.

Yet the dealer and the buyer should inquire into these things. They are of utmost importance to every buyer who is attempting to select the greatest value for his money. In the last analysis these factors almost alone determine the comparative value of the various makes of cars.

You will see Paige motor cars exhibited. You will see that they are better designed, better equipped, better built cars than are sold at anywhere near Paige prices. You will see such features in Paige cars as the multiple disc cork insert clutch, silent chain drive for motor shafts and a score of other equally high-grade features. You will see a complete electric lighting and starting system on the Paige "25" selling at \$975—the first car with this equipment at less than a thousand dollars.

PAIGE

And you will realize that Paige cars offer an extra value for the money.

But to know why the Paige Company is able to produce so much better car for the money than competing manufacturers you must know the Paige organization.

Inquire into the capitalization of the Paige Company and you will find that the total capital stock amounts to just \$250,000. This is all the stock that must earn dividends.

But suppose that, instead of this moderate capitalization, it were twenty or thirty millions. We would have to earn dividends on all of it and we would have either to take these dividends out of the car or add them to the price. Isn't that plain?

This capital is all GENUINE capital. The Paige Company does not believe in including a single dollar for patents, good will and valuable trade names, let alone five to twenty-five million as some prominent manufacturers are doing. And the stock is all common—no

PAIGE-DETROIT MOTOR CAR COMPANY

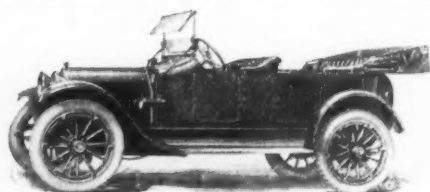
Paige 36 Specifications

116-inch wheel base; left side drive and center control; powerful 4 x 5-inch Paige motor, unit power plant; silent chain drive for cam shaft, pump and generator; perfect and smokeless lubrication; gasoline supply carried under shroud dash, with short, straight feed from tank to carburetor; multiple disc cork insert

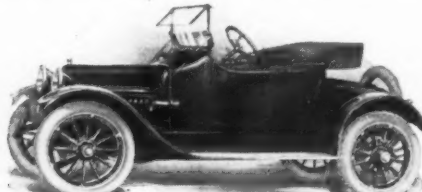
clutch; aluminum castings for strength and light weight; extra deep radiator; crowned fenders; deep tilted 10-inch cushions.

Gray & Davis large unit electric starting and lighting system; ventilating windshield built into body; silk mohair top,

tan lined; Jiffy curtains; Stewart revolving dial speedometer; 12-inch electric head lights; 5 demountable rims; Good-year, Goodrich or Diamond tires, with non-skid in rear; Bosch magneto; and all incidental equipment.



PAIGE 36 GLENWOOD
\$1275



PAIGE 36 WESTBROOK
\$1275



PAIGE 36 NEWPORT
\$2250

Please mention The Automobile when writing to Advertisers

Shows won't Show

preferred, with guaranteed dividends which must be paid whether advisable or not.

Then the attitude of the Paige stockholders helps wonderfully in putting extra value into Paige cars. They are big, substantial business men who do not regard the automobile business as a GAME at which they expect to clean up a fortune within a few years' time.

They are satisfied with moderate earnings on their investment and insist that every dollar above these moderate earnings shall be put back into the car every season.

And it IS put back, giving more and more value to Paige purchasers.

Then again, the Paige Company carries not a dollar's worth of bonded indebtedness. Remember this point and check it up when comparing car values. Put into figures, this point alone gives the Paige Company a five to seven percent advantage over competing makers.

The economical manufacturing conditions existing at the Paige plants mean MORE extra value.

The Paige selling system through DEALERS ONLY is another factor. There are no extravagant branches to be maintained at the expense of Paige buyers.

PAIGE

The large output (13,500 cars this coming year) and the financial strength of the Paige Company command the lowest prices and finest work from parts manufacturers.

All these factors play a part toward building up Paige EXTRA VALUE.

When you know these things you will understand why the Paige Company has gone along, year after year, building better cars—cars that “wiseacres” in the trade have, time after time, predicted could not be

continued at the prices asked.

With these facts in mind you will take more than ordinary interest in the Paige exhibits at the coming shows.

Or, if you are not able to attend the shows you will certainly want to see the Paige models at your dealer's.

You will find the famous Paige “36” touring car and roadster selling at \$1275. Also three closed body types ranging from \$1850 to \$2250. And the Paige “25” touring car and roadster at \$975.

For further information, wire or write,

304 Twenty-First Street, DETROIT, MICH.

Paige 25 Specifications

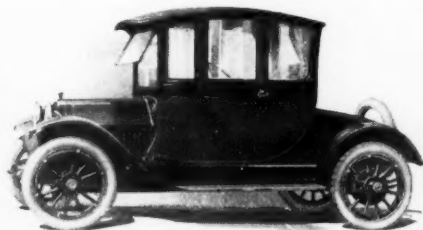
110-inch wheel base; semi-streamline body design; roomy tonneau; wide seats and wide doors; deep Turkish cushions; quiet Paige motor; electric starting and lighting system includes generator, start-

ing motor, storage battery and full lamp equipment; 32x3½-inch tires, Goodyear, Goodrich or Diamond, with non-skid in rear; rain-vision and ventilating windshield; silk mohair top and top-boot;

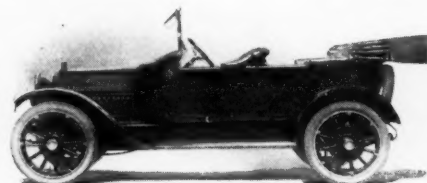
quickly adjustable inside curtains; 5 demountable rims; Bosch magneto; speedometer; linoleum-covered, aluminum-bound floor and running boards; foot-rail and robe-rail; dimmers in headlights; horn, jack, tools, pump, tire repair outfit, etc., complete.



PAIGE 36 MAPLEHURST
\$1950



PAIGE 36 MONTROSE
\$1850



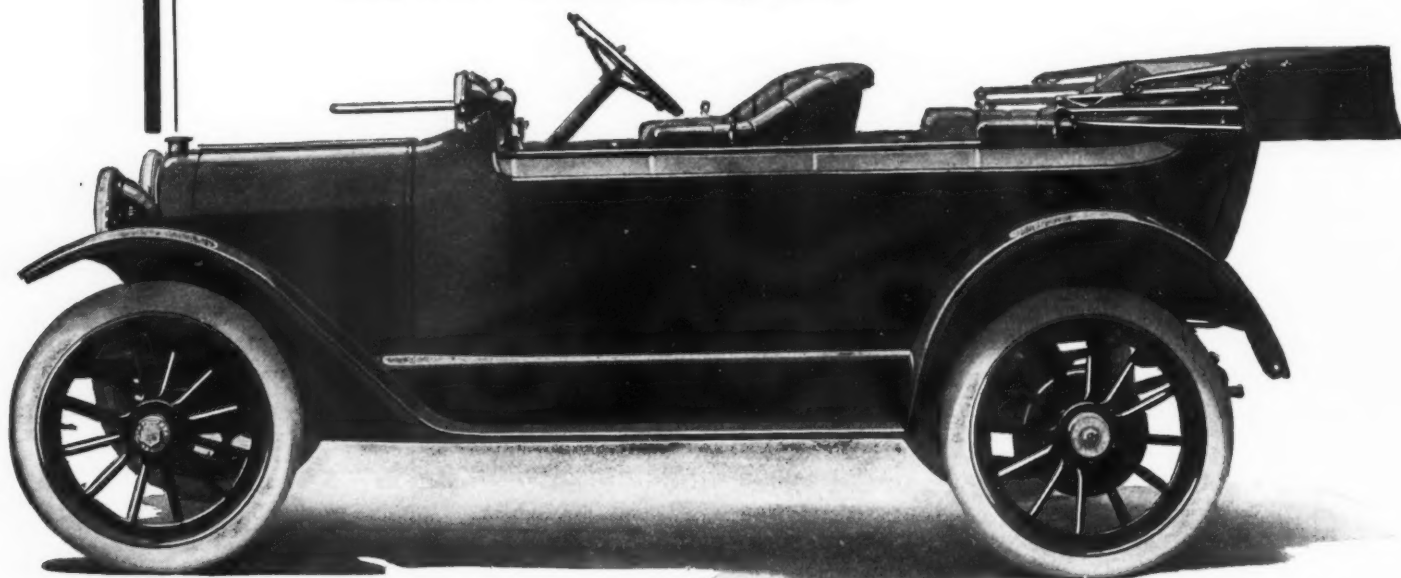
PAIGE 25 BRUNSWICK
\$975

Please mention The Automobile when writing to Advertisers

Detroit

New and Distinctive

These are those new "Detroids." They put the popular priced car into direct competition—point by point—with practically all the expensive makes of fours—something never before accomplished.



Model B, 1914 Touring Car—
A New Accomplishment in the
Making of Automobiles, Mark-
ing the Finest Example of High
Quality at Low Cost.

\$925

Detroit-Remy Electric Start-
ing and Lighting System—\$125
Extra.

Models:

Series A—\$850—\$1025

Series B—\$925—\$1050

Write for "Detroit" Literature



With its beautiful stream line, its more powerful, long stroke motor, its faultless starting and lighting system, and inbuilt excellence of finest engineering skill, the "Detroit" possesses a distinction of appearance and a soundness of construction that cannot help but raise the question immediately in the hands of thousands who desire to own a car,—
"Where can I really get **more**, no matter what I pay?"

Beauty? Note the exquisite proportions of the new 1914 touring car; or the snappy, jaunty lines of the new red speedster.

Power? A new and bigger motor ($3\frac{1}{2} \times 5$) carries this light weight vehicle without exertion anywhere its wheels can find traction. We do not believe there is an automobile made, four or six, big or little, \$1000 or \$5000, that can out-pull it.

Convenience? The new Detroit-Remy electric starting and lighting system is the cleanest installation ever devised, and it adds less than 40 pounds to weight of car.

Simplicity? The photograph of the dash control shows it—everything at your fingers' ends.

e Models for 1914 **Detroit**

All the sterling features that made the "Detroit" great are retained: platform springs, full floating rear axle, ball bearings throughout—such features as only the costliest cars have ever before specified.

The "Detroit" organization—

methods without waste—buying in quantities at the bottom of the market—producing, not in yearly models, but steadily abreast and ahead—make these things possible.

The greatest models of their class yet produced are these new "Detroiters."

A Mile A Minute Detroit—THE KANGAROO—\$900

On the track this car, with its new and bigger 1914 Detroit motor, has made more than a mile a minute. It is stripped of every ounce of superfluous weight; has flush lines everywhere; smooth-drawn upholstery; concealed lighting apparatus; not an ungainly angle or hook or knob anywhere. Just speed.

Tire carrier with tool box, enclosing full equipment of tools and repair kit, is at the rear, inclined above fuel and oil tanks—of 20 and 3 gallons capacity respectively. Utility box is hidden beneath the seat.

Lighting switch, magneto switch, pedals and speedometer are in the sloping dash. Battery lighting or Prest-O-Lite is optional. Detroit - Remy self-starting and lighting system is \$125 extra.

Colors are fire-chief red or dulled gray, with black fenders.

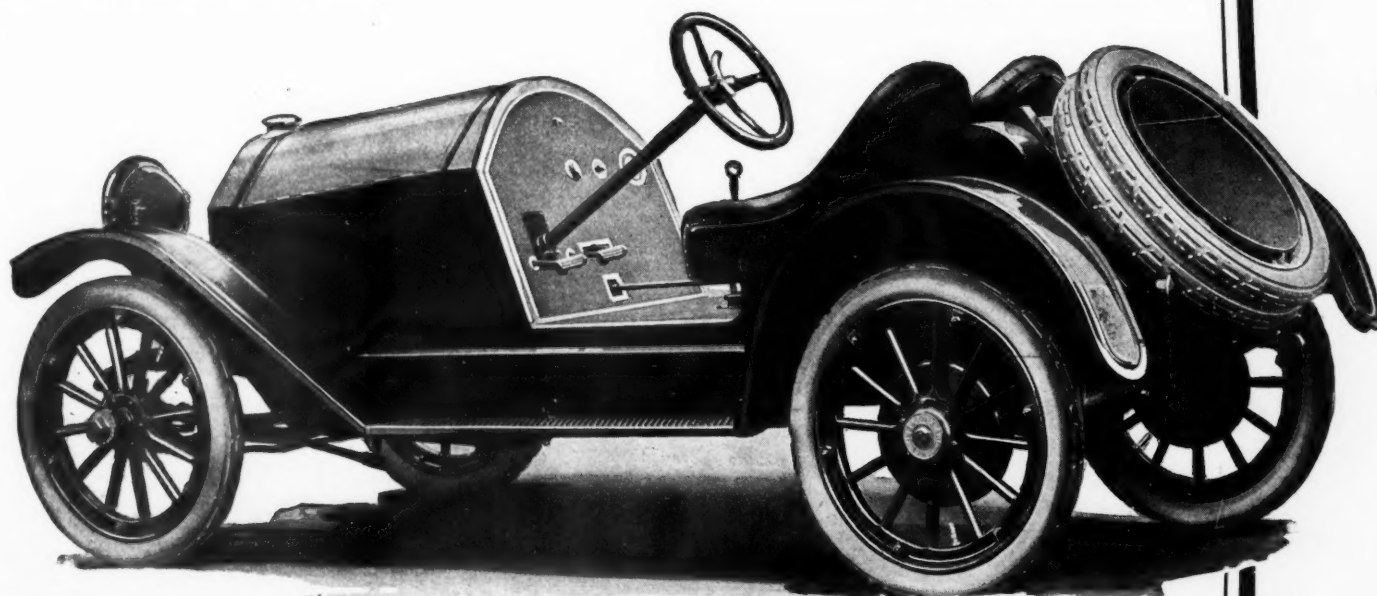
Only 150 of these speedsters will be manufactured this season. Also, two weeks must be allowed between receipt of order and delivery.

The safe course is to get in specifications quick.

Briggs-Detroit Company

451 Holbrook Avenue

Detroit, Mich.



Please mention The Automobile when writing to Advertisers

WARNER AVTO-METER

WINTON SIX

Long stroke motor, left drive, center control, electric lights, self-starter, fur mohair top, easily harnessed curtains, rain-vision front, best Warner speedometer, Waltham eight-day clock, Klaxon electric horn, tire carriers, four-cylinder tire pump, demountable rims, full set of tools, German silver radiator, metal parts nickel finished. Fully equipped, \$3250

Chosen
for practically
ever high
priced car in
America

THE supremacy of the Magnetic Speedometer will be more evident than ever at the coming automobile shows. Over 90% of all

the high priced cars will be equipped with Warner (magnetic) Auto-Meters. Following is the list of high-priced cars that are now Warnerized:

Ahrens-Fox
American
Apperson
Auburn
Austin
Bailey
Benton
Benz
Brintwell
Buick
Cadillac
Cartiercar

Case
Century Electric
Chadwick
Chalmers
Church-Field
Cole
Columbia
Crawford
Crescent
Crow
Cunningham
Detroit Electric

Easton
Federal Truck
Fiat
Gabriel Truck
Garford
Great Eagle
Grinnell
Hawes
Haynes
Henderson
King
Kissel

Lyons-Knight
McFarlan
Marmon
Maxwell
Moon
Multiplex
Oakland
Ogren
Ohio Electric
Pathfinder
Peerless

Pierce-Arrow
Pilot
Premier
Rambler
S. & M.
S. G. V.
Seagrave
Seitz
Simplex
Speedwell
Stafford

Staver
Stevens-Duryea
Stutz
Tate
Touraine
Traveler
Vehle
Westcott
White
Winton
Zimmerman

See that the car you buy is

Chicago, Ill.

Stewart-Warner Speedometer Corporation.
Branches and Service Stations in all principal cities

Beloit, Wisc.

Have You a Small-Car Engine?

Simplex

Lancia

Knox

Cylinders.....four

Bore.....3¾ inches

Stroke.....5¼ inches

How fast do you think an electric starter ought to spin it, using 95 amperes at 5.6 volts?

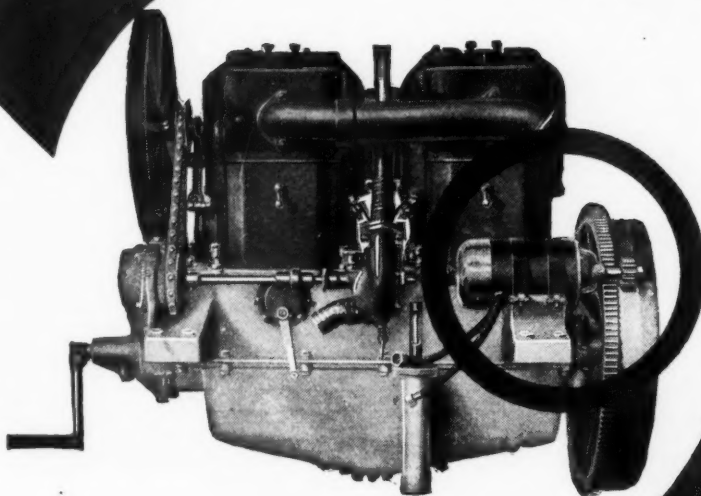
A certain manufacturer, whose engine nearly matched the above dimensions, was getting 90 r.p.m. with 90 amperes from a certain starter. The starter had the usual double-reduction train of gearing.

It happened that we were able to put the Rushmore Model C Starter in the place occupied by the gear train, so that it meshed directly with the fly-wheel, thus cutting out one reduction.

With a gear-to-pinion ratio of 6¾ to 1, the Rushmore Starter spun the engine at

175 r.p.m.

using 95 amperes at 5.6 volts.



The Starter that starts with a rush is

The RUSHMORE STARTER

The Rushmore Starter spins any engine 25 to 60 per cent. (or more) faster than any other starter taking equal current. It is so economical of current that it will spin an engine steadily for 45 to 60 minutes on one charge of a 120 ampere-hour battery.

One more point—by cutting out the intermediate gears, the Rushmore outfit in the case above quoted saved 30 pounds' weight and \$24 in cost to the manufacturer. Yet it gave a system in every way more durable, efficient and satisfactory.

We make starters for automobile and marine engines up to 6 cylinders, 6½ x 8 inches. A recent installation on a 175 h.p. marine engine showed a spinning speed of 126 r.p.m., using 4.35 h.p.

Regal

Mercer

Kline

RUSHMORE DYNAMO WORKS *Plainfield, N.J.*

Standard equipment in America on Mercedes, DeDion-Bouton, Isotta Fraschini, Austrian Daimler Delaunay-Belleville.

*Editorial from The
of New York on Detroit*

GROWING DEMAND FOR GOOD AUTOMOBILES

**INDICATED BY THE RAPIDLY GROWING BUSINESS OF THE
MAXWELL MOTOR COMPANY, INCORPORATED, OF DE-
TROIT—PRESENT LOW PRICES OF THIS COMPANY'S
STOCKS DUE TO DEPRESSED FINANCIAL CONDI-
TIONS AND DOES NOT REFLECT THE AC-
TUAL CONDITION OF ITS BUSINESS**

(Editorial Staff Correspondence.)

The stock market is quite frequently a poor barometer of actual trade conditions and its quotations are especially untrustworthy as regards the actual condition of individual enterprises whose securities are actively traded in. The majority of investors who are not conversant with actual conditions look to the quotations on the financial page of the daily press and are naturally discouraged when the stocks in which they have placed their money are quoted at considerably below the price which they have placed their money are quoted at considerable below the price which they paid for them. This, of course, means actual loss to the trader who buys on margin, but to the bona fide investor it should cause no undue uneasiness as financial and other conditions entirely unrelated to the actual operations of the company in which he may be interested may have such a bearing upon the stock market generally than his stocks have been forced to decline in sympathy with the entire list. At the same time the corporation whose property they represent may have never been in a more prosperous condition and its prospects never brighter.

A case in point at the present time is to be noted in the various stock issues of the Maxwell Motor Company, Incorporated.

This well-known manufacturer of automobiles has listed its securities upon the Detroit Stock Exchange, the favorite clearing house for automobile stocks, and they are now quoted at prices ranging from one-third to one-fifth of their actual book value. Just recently a reader of this publication residing in a small city in Michigan made inquiry as to the present status and future prospects of the above company and his communication was forwarded to the writer for personal attention and reply as the headquarters of the Maxwell organization are in Detroit. After an investigation into the matter, including interviews with leading officials of the company and bankers here, the following information was obtained. As Maxwell stock is somewhat widely distributed a review of the facts will not be out of place in our columns and we accordingly are glad to give it wide publicity.

Maxwell first preferred is now selling around twenty, the second preferred is quoted at between five and six and two is bid for the common. An analysis of its last statement and an examination of its financial affairs and present output shows the book value of its first preferred to be no less than \$50, while the second preferred and common are worth \$25 and \$10 respectively. These latter figures represent

the real value of the company's net assets at the present time, while taking into consideration its rapidly growing business in this and other countries. Those conversant with the facts in the case are predicting that the full dividend will be earned and paid in 1914 on the first preferred, which will be reflected by a sharp upward movement in the price of this class of stock which in turn will favorably affect the second preferred as well as the common. It would appear, therefore, that the Maxwell issues offer exceptional opportunities at the present time to investors. It is rather difficult to say just what has been the exact cause of the slump in these and other securities, the most logical explanation being the present tightness of money and none too favorable conditions in the industrial world generally. Then it must be remembered that the underwriters of the Maxwell stocks did not put them out at inflated figures nor engage in any advertising campaign. As a matter of fact they have always been traded in in the open market at figures around present quotations. The Balkan wars have absorbed a vast amount of European capital which had formerly been available for investment in this and other countries, tariff agitation has had a more direct effect upon the country's industries, Wall Street is still apprehensive of

Please mention The Automobile when writing to Advertisers

Mercantile and Financial Times Automobile Conditions —

an expensive Mexican war, while short crops in some sections of the country have all combined to make general financial conditions quite unsatisfactory, this state of affairs being apparent in other countries as well, including Canada. In spite of this, various industries continue to expand, although their progress is not manifested by prevailing stock exchange quotations. Conditions, on the whole, are promising for the more responsible automobile manufacturers; the weaker ones having failed to stand the acid-test of healthful competition and their elimination cannot prove other than beneficial to the industry generally.

The Maxwell Motor Company, Incorporated, I find, continues to develop its business without regard to what occurs upon the floor of the Stock Exchange. While naturally desirous of having its various securities quoted at their real value, for the satisfaction of its stockholders, if for no other reason, its management realizes that general conditions in the money market are to blame and therefore pay no attention to price fluctuations. It has no bonded indebtedness to pay interest on and its net earnings are, therefore, all available for future expansion. It has a conservative capitalization, so that every dollar of invested capital will receive its full quota of dividends when such are declared. It is well to remember that this company is less than a year old, representing a consolidation of eight corporations engaged in the manufacture of automobiles and parts. The plants of some of these have been closed and will be offered for sale and their product are now being turned out in the remaining establishments which have been adapted to this change; large economies in production and managing costs having been effected in this manner. At the present time the company is producing and selling over 1,200 cars per month and finding it difficult to keep up with the demand. Early in 1914 this output will be double what it is at the present time, the various operating plants in Detroit, Dayton, Ohio, and Newcastle, Ind., now being extended with the idea of making their maximum capacity no less than 4,000 cars per month, or nearly 50,000 per year. Advance orders have been coming in from Maxwell dealers throughout the United States and Canada at the rate of five hundred per day. Since organization this company has devoted its energies to increasing the output, strengthening the manufacturing and sales organization, in getting out the new models and preparing for a future era of prosperity. Three cars are now being turned out which are conceded by the trade and motorists to be among the best ever placed upon the

market at any price. These are the Maxwell six-cylinder fifty-horsepower at \$1,975; the Maxwell four-cylinder thirty-five horsepower at \$1,225, and the Maxwell four-cylinder twenty-five horsepower at \$750. In their respective classes these represent the acme of motor car value. They represent one hundred cents' worth of actual car value in appearance, speed and durability for every dollar of price and particularly popular is the 4-25 at \$750. Over 1,000 a month of these have been sold since they were first introduced in July and the company is finding it hard to keep up with the demand. This has been because it has all the good features of a car selling for from \$1,000 to \$1,250, including seating capacity and leg room, stream line body design, three-speed selective transmission, large tires, standard magneto ignition, a motor which will develop more than its rated horsepower, three-quarter floating rear axle and many other features whose value are apparent at a glance to the experienced motorist, but whose full description is not necessary in an article of this scope. Lightness has been secured solely through the use of only the best of materials and not at the strength of durability. It is a great hill climber and will shoot across a stretch of deep sand where the sixty-horsepower car of the dreadnaught type would hopelessly flounder. It appeals not only to the man of modest income who must not only consider first cost but maintenance expense as well, but to the man of more ample means who may perhaps have an expensive heavy car but desires a lighter one for touring over rough country or for town use. And speaking of maintenance cost, that is something which distinguishes the Maxwell 4-25. By reason of the quality of its materials repair bills are reduced to a minimum and as every part is made by automatic machinery and machined to the thousandth part of an inch absolute interchangeability has been secured so that when a new part is needed it can be installed by almost any one handy with a monkey wrench or at least by the most mediocre of garage mechanics. The driver of the Maxwell 4-25 can go just as fast, cut as good a figure and get as much service out of his car as his neighbor can out of any other make costing up to \$2,000, and he probably sleeps a whole lot better at nights on account of not having so much money tied up in the first purchase price and because his running expense is considerably lower. And what applies to the cheapest model is true of the more expensive ones in corresponding measure. The writer was privileged to inspect the company's line at its plant at Woodward Avenue and Warren Street, this city, and was much impressed with their evident superiority over other cars selling at anything like the same price.

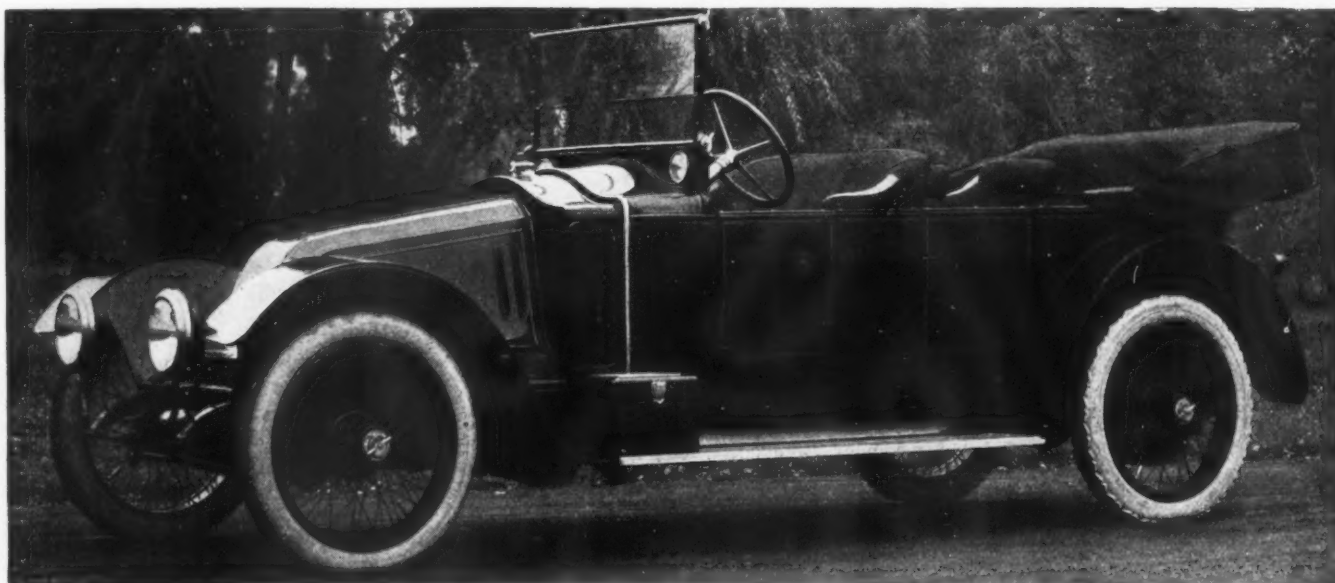
Another thing which is well worth bearing in mind is the fact that the company does not maintain an expensive chain of branch houses in the leading cities but sells

its product direct to the public through dealers at all points. The company welcomes competition and many Maxwell dealers who handle other lines report that the Maxwell is sure of the lion's share of public attention when displayed and demonstrated. This selling through dealers means considerable from the economy standpoint, a fact which the company's security holders and prospective customers will be quick to appreciate.

The management of the Maxwell Motor Company, Incorporated, is composed of engineers, not financiers, which is probably the reason why they manifest such little concern about the present quotations of its stock. The president and general manager is Mr. Walter E. Flanders, one of the best known men in the industry to-day. He was originally connected with the Ford company as factory manager, and later on organized the E. M. F. corporation, in which he was the moving spirit, president and general manager. When the E. M. F. corporation sold out through J. P. Morgan & Co., of New York, to the Studebaker Corporation, Mr. Flanders became general manager of the Studebaker organization and resigned that position to become chief executive officer of the Maxwell company. Mr. Flanders has been fortunate in surrounding himself with a staff of managers, department heads, engineers and designers who have developed team work to a marked degree and from a personal standpoint the company is exceptionally well favored. The latest acquisition to the official staff has been Mr. Jesse A. Vail, recently appointed chairman of the Board of Directors. Mr. Vail graduated from the Worcester Polytechnic Institute, of Worcester, Mass., and later became sales manager, and then general superintendent of the Hooven, Owens, Rentschler Co., manufacturers of Corliss engines, at Hamilton, O. He then became New York manager for the Allis-Chalmers Co., of Milwaukee, and up to the time of his connection with the Maxwell company had been general manager of the Fairbanks-Morse Manufacturing Co., manufacturers of gas engines at Beloit, Wis.

The management of the Maxwell Motor Company, Inc., regards the outlook for 1914 as exceptionally encouraging. Preparations are being made for an unprecedentedly large output, and from every angle this \$37,000,000 corporation is operating upon a most stable basis. We would urge upon our inquiring subscriber and others who may become unduly alarmed at the prevailing prices of the Maxwell stocks to pay less attention to stock market quotations and ascertain the real facts in the case from headquarters. These we have endeavored to furnish from an unbiased standpoint and can only say that we regard the outlook as very favorable to Maxwell stockholders notwithstanding what the ticker has to say upon the subject at the present time.

Please mention The Automobile when writing to Advertisers



KEETON—CLASS IN EVERY LINE—CAR-NATION

The new "Six-48" Keeton represents the sound elements of European and American engineering practice. There is nothing extreme or radical in the design or construction. Everything about the car impresses the observer as having that indefinable air of caste and quality that always distinguishes a masterpiece.

The distinctive beauty of line and the comfort as well as exclusiveness in use are further emphasized by the rich color combinations of which the purchaser is given his choice.

You will be surprised at the number of people in your territory who will be exceedingly interested in the new "Six-48" Keeton.

KEETON SPECIFICATIONS

MOTOR—Six Cylinder, 4" bore, 5" stroke cast, en bloc, "L" head.
IGNITION—Eisemann Dual High Tension Magneto, Automatic Spark Advance.
ELECTRIC STARTING, LIGHTING—"Jesco" Starting and Lighting System, single unit type.
COOLING—Centrifugal Pump and powerful fly-wheel fan insure ample cooling.
FRONT AXLE—Elliott type, ball thrust bearing in yoke head.
REAR AXLE—Full floating type, gear ratio 3 3/4" to one. Imported annular bearings.
BRAKES—Brakes cam actuated internal expanding large diameter.
CONTROL—Left side drive, right hand control.
STEERING—Worm and full Gear Type with thrust bearings, 18" or 20" walnut wheel.

CLUTCH—Cone shaped steel discs running in oil housed in fly wheel.

TRANSMISSION—Selective type, 4 speeds forward and reverse, direct on third, imported annular bearings.

WHEELS—Five interchangeable wire wheels 34" in diameter, 4 1/2" tires.

SPEEDOMETER—Warner Autometer with clock combination.

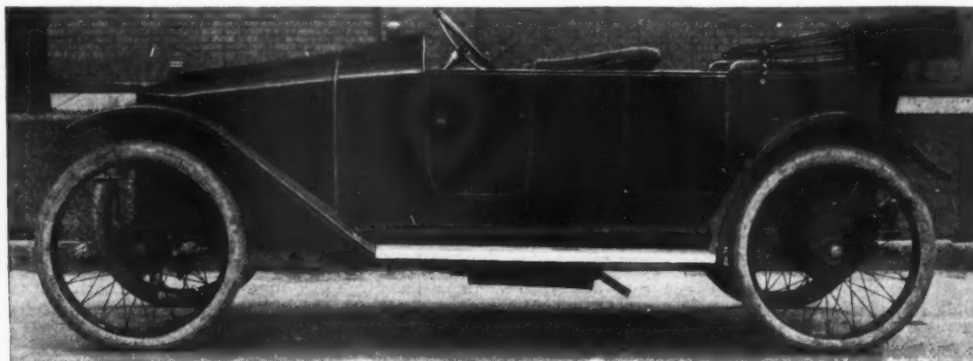
HORN—Large Klaxon.

AIR PUMP—Mechanically operated, two cylinder compressor.

WHEEL BASE—136".

PRICES—F.O.B. DETROIT

2 passenger Roadster, completely equipped...\$3250
 7 passenger Touring car, completely equipped 3250
 A full line of open and closed bodies.



4 Passenger CAR-NATION Touring Car

CAR-NATION SPECIFICATIONS

Unit Power Plant—Motor—4 cyl. en bloc 3 3/4" x 3 3/4" "L" head—large valves and bearings. Very quiet and powerful.
Ignition—Magneto—Fixed Spark.
Lubrication—Constant Level Splash—Plunger Pump.
Carburetor—Approved Type—very economical.
Cooling—Thermo-Syphon. V-shaped radiator adjustable belt driven fan.
Clutch—Multiple steel disk type running in oil.
Transmission—Selective type 3 speeds forward and reverse—One lever control.
Drive—Bevel gear through concentric Torque tube with one universal joint.
Rear Axle—Semi-Floating Type, Hyatt Roller Bearings.

Brakes—Emergency, Internal Exp. on 10" drum on rear wheels. Service external contracting on transmission shaft.

Wheels—Detachable wire—30 x 3" clincher rims and smooth tread tires.

Control—L. H. drive center control.

Wheel base 104".

Tread 48".

Standard equipment—Horn—Head Lamps and Tail Lamp, with set of tools.

PRICES

Model A—2 passenger Roadster.....\$495.00
 Model B—2 passenger Tandem Type..... 510.00
 Model C—4 passenger Touring Car..... 520.00
 Extra Equipment: Top \$25.00—Windshield.... 10.00

MORE THAN A CYCLE CAR

CAR-NATION

THE CAR FOR THE AMERICAN PUBLIC

"Car-Nation" stands for "class" among any type of cars—not only among cycle cars and small cars, but among the big ones too.

The parts of the Car-Nation are features on cars costing two and three times as much.

The V-shaped radiator—stream line body—wire wheels—tapered hood and cowl—low center of gravity, cantilever springs, all combine to give it an air of distinction that attracts your attention at once.

Many cars have featured one or two of these different points but the Car-Nation combines all of them.

The initial cost is low, its appearance is smart and the upkeep is practically nothing—in fact the "Car-Nation" meets every requirement in cost—speed—power comfort and appearance.

It will pay you to get in touch with us in regard to your territory.

Manufactured by **Keeton Motor Co., Detroit, U. S. A.** See Our Exhibits at New York and Chicago

Please mention The Automobile when writing to Advertisers

To Agents of cars equipped with an "electric horn"—

When your customer comes back to you and says:

"My horn has gone to the bad. It won't work. I have got to have another. But not like this one. This time I want the best. Give me something that will stand up—"

That is the time you can sell him a Klaxon—easily.

The Klaxon is a permanent investment—guaranteed permanently. When a man buys a Klaxon that is the last cent he will have to spend for signal equipment—on his present car or on future cars. That is why its PRICE is more—but its COST less.

THE KLAXON is not an "electric horn." It is entirely different. Its principle is different. Its construction is different. Its note is different. This difference is the difference between temporary and permanent service—between a feeble, ineffectual "buzz" and a powerful, clean-cut WARNING.

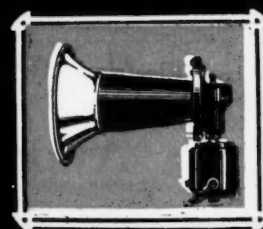


KLAXONET

Lovell-McConnell Mfg Company Newark, N.J., U.S.A.

KLAXON

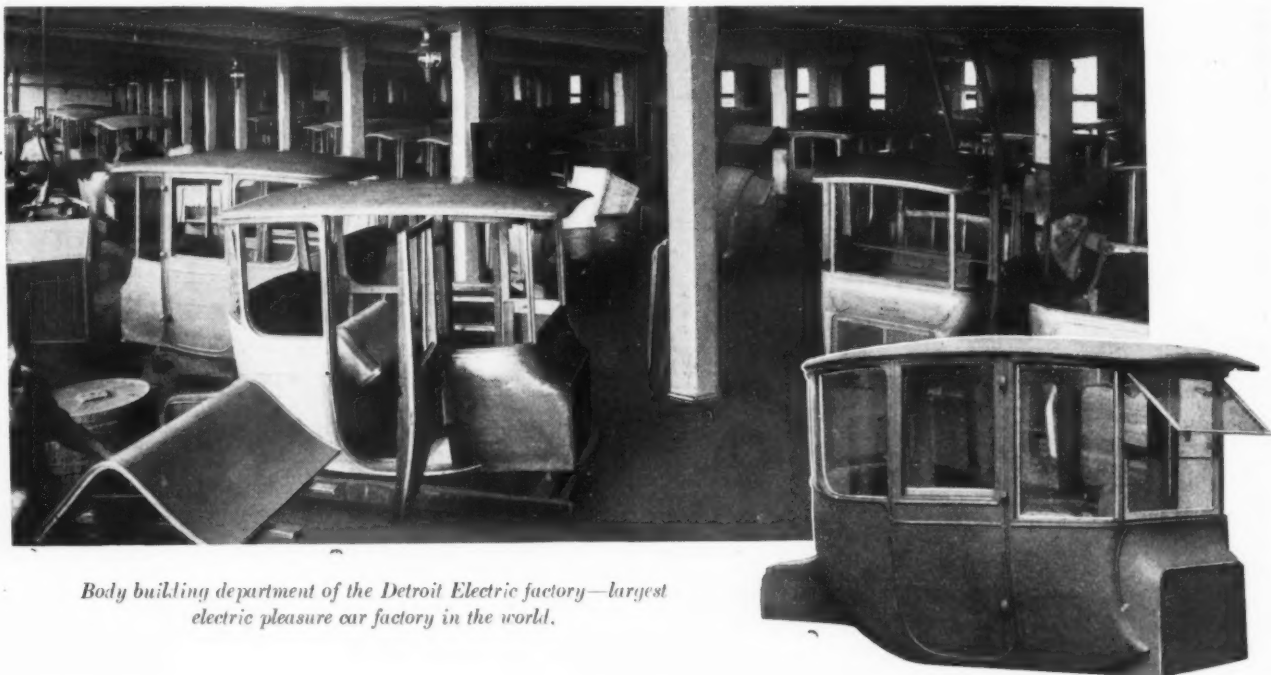
"The Public Safety Signal"



KLAXON

This advertisement planned, written and set up entirely in the Klaxon Factory. Type composition by the Klaxon Press with "Klaxon" type especially designed by Goudy.

Please mention The Automobile when writing to Advertisers



Body building department of the Detroit Electric factory—largest electric pleasure car factory in the world.

How Quality Is Built Into Detroit Electric Bodies—A Point for Dealers

EVERY dealer knows that appearance is a prime factor in selling an electric automobile. To some purchasers it is the only consideration. Mechanism is too often forgotten—or taken for granted. Beauty of line is sought always; grace of curve, elegance of finish, luxury of upholstery, completeness of appointments.

In the building of a Detroit Electric, "quality first" is the watchword both in the making of the mechanical parts and in the designing and finishing of the bodies.

Thus, in the Detroit Electric is created a degree of mechanical and esthetic perfection to be found in no other electric. That is why sales of the Detroit Electric are double the sales of any other electric.

The Detroit Electric is the only electric with a one piece aluminum top. This material is imported especially for us. Aluminum is used in the Detroit Electric body wherever it will add to

THE
Detroit
ELECTRIC

beauty or strength—in the panels, window sash and moldings, hoods, roofs. Though costly, aluminum makes for long life of the body. It is lighter in weight than steel and can be more easily shaped

into artistic forms. It will not warp; it will not crack; it will not check.

Rattling and squeaking, too, are unknown in Detroit Electric bodies. Noise is eliminated. Felt cushions separate the top from the framework of the body; rubber cushions separate the body itself from the chassis.

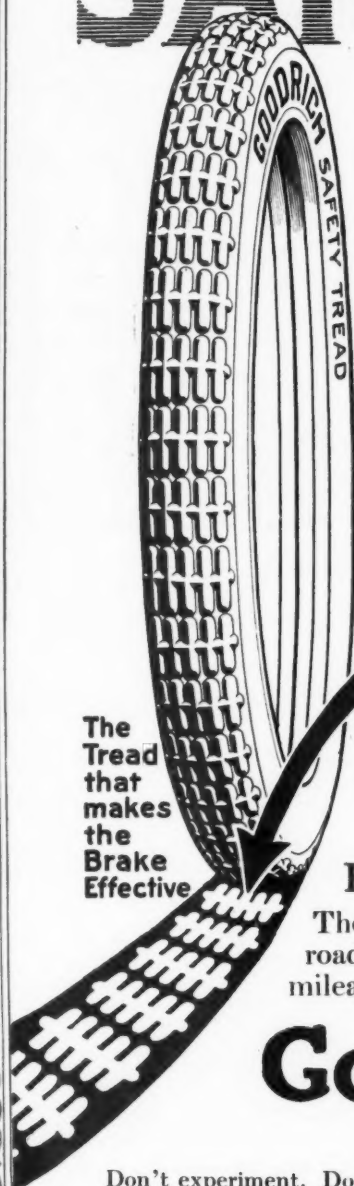
Write for the new illustrated Detroit Electric catalog.

Anderson Electric Car Company
DETROIT, MICH.

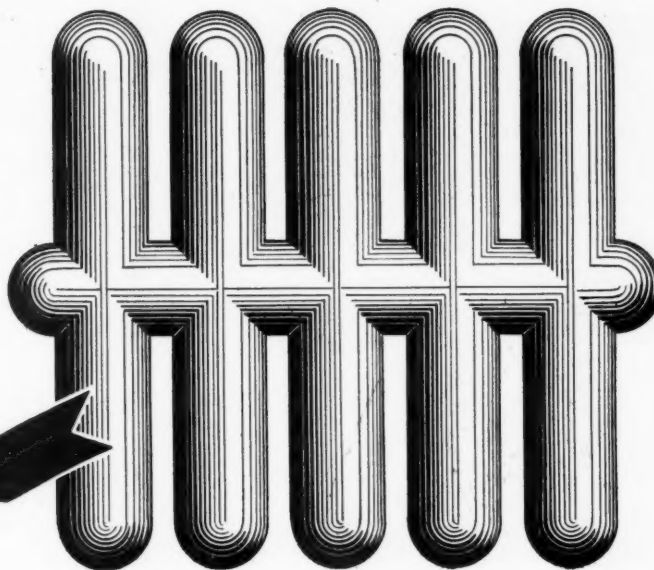
Builders of the Detroit Electric

Largest manufacturers of electric pleasure vehicles in the world

SAFETY FIRST



The Tread that makes the Brake Effective



Five Bars and a Cross Tie—the Safety First Symbol

Five thick, tough Goodrich rubber fingers—

They dig down through mud, slush and ooze; they clean and grip the road. They stop the skid before it starts. They give you lower-cost mileage because of the extra thickness of rubber at the point of contact.

Goodrich ^{Safety} _{Tread} Tires

Best in the Long Run—Best in the Short Stop

Don't experiment. Don't take chances. Look for the five bars and the cross-tie when you choose a non-skid tire. Read the reduced prices below. Better still, tear out this price list and hand it to your dealer.

Don't pay more than the prices named here for the accepted *standard* non-skid tires:

Size	Smooth Tread Prices	Safety Tread Prices	Size	Smooth Tread Prices	Safety Tread Prices
30 x 3 - -	\$11.70	\$12.65	34 x 4½ - -	\$33.00	\$35.00
30 x 3½ - -	15.75	17.00	35 x 4½ - -	34.00	36.05
32 x 3½ - -	16.75	18.10	36 x 4½ - -	35.00	37.10
33 x 4 - -	23.55	25.25	37 x 5 - -	41.95	44.45
34 x 4 - -	24.35	26.05	38 x 5½ - -	54.00	57.30

Dealers almost everywhere have Goodrich Tires in stock or can get them for you from one of our branches or depots.



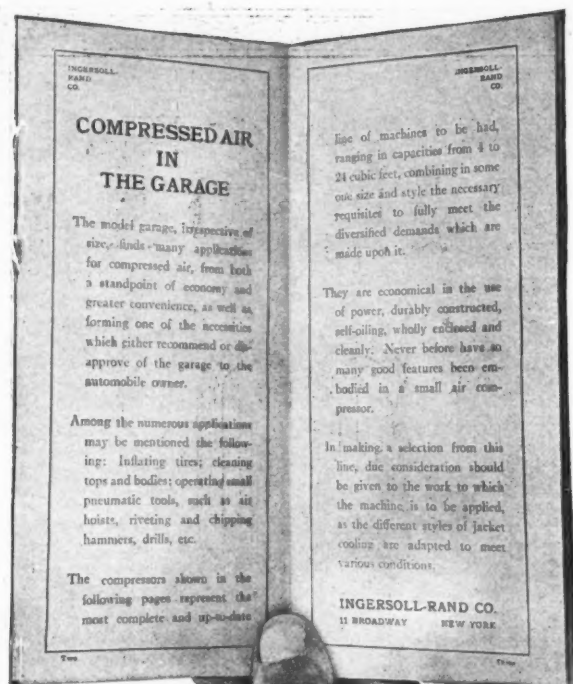
Factories:
AKRON, OHIO

The B. F. Goodrich Company

Branches in All
Principal Cities



There is nothing in Goodrich Advertising that isn't in Goodrich Goods



6762

Send For This Book

If you are a Dealer, this pamphlet will post you on the most up-to-date, complete and diversified line of small air compressors that you can add to your stock.

If you are a Garage Man, it will show you the compressor you want for your own place—one exactly adapted to your individual needs and one you can depend upon.

If you are a Car Owner, this booklet will give you facts on garage air compressors that will enable you to buy yours as intelligently as you buy your car.

The Book Is "Compressed Air in the Garage." It's Free.

Ingersoll-Rand Co.
11 Broadway NEW YORK CITY

Offices The World Over

Splitdorf "Ford Special"

Waterproof High Tension Magneto

is enclosed gear driven—no chains or open gears—and is a magneto of the highest grade of attractive appearance and easily installed upon Ford cars.

A SPLITDORF "Ford Special" magneto increases motor efficiency 33 1/3 per cent., saves its cost in less gasoline consumption, assures constant electric lighting and is installed easily, quickly and inexpensively.

Write to nearest Branch House for Details.

SPLITDORF ELECTRICAL CO.

Atlanta—10-12 E. Harris St.	Newark—290 Halsey St.
Boston—180-182 Mass. Ave.	New York—18-20 W. 63d St.
Chicago—64-72 E. 14th St.	Philadelphia—210-12 N. 13th St.
Detroit—972 Woodward Ave.	San Francisco—1028 Geary St.
Kansas City—1823 Grand Ave.	Seattle—1628 Broadway
Los Angeles—1226 S. Olive St.	London, Buenos Aires

A reliable Electrical Measuring Instrument indicates quality.



Weston Model 267 Dashboard Ammeter.

WESTON AMMETERS

for control of Electric Lighting and Self-starting Systems are the most reliable, durable and highest grade instruments made for this purpose.

Please send for our 30-page bulletin No. 8 describing them.

Weston Electrical Instrument Co.
NEWARK, N. J.

New York	Boston	Denver	Birmingham	Montreal
Philadelphia	San Francisco	Cleveland	Toronto	Paris
Chicago	St. Louis	Detroit	London	Berlin

PLUG THAT RADIATOR LEAK PERMANENTLY

WITH

"CHEMICALLY CORRECT"

SEMENTOL

FINDS THE LEAK AND FIXES IT



Makers of **BRASS-KOTE**

Simple, Efficient and Economical

The **K-W Electric Headlight Outfit, \$40**

Complete Outfit: Generator, Head Lamps, Switch, Wire and Bulbs



Easy to Install Mount in any position
Runs in either direction
Has only one moving part. No commutator or brushes
Gives 2.16 C.P. Headlights

Send for descriptive folder. We also make a K-W Ford Electric Headlight Outfit, \$15 for Ford Cars with Flywheel Magneto; and the famous K-W Master Vibrator, the Standard by Which All Others Are Judged.

THE K-W IGNITION CO.
2833 CHESTER AVENUE CLEVELAND, OHIO, U.S.A.

Do Your Own Welding!

Save time and money on repair jobs! Don't send out your repair work. You can now *do it yourself*—and save a lot of time for your customers and money for yourself.

Don't buy and wait for new parts! You can *make old parts as good as new* by using the

Cox Welding Outfit

For Welding and Carbon Removing

Complete in every detail. Will do every possible welding job. Very simple in construction. Can be used on parts of iron, steel, brass, bronze and aluminum. Any average mechanic can become adept in its use in a short time. We furnish complete instructions with each outfit. It is *safe and sure*. Every job you do means,—*Extra Profit for You*.

The outfit will pay for itself many times over. It means quick repair work—and *all of it done in your shop!*

The Cox Outfit is not only excellent for welding, but it can also be used to *Quickly and Completely Remove Carbon from Cylinders!*

Thus you have a dual outfit—a profit maker two ways! Its use is doubled. It saves time in two ways—and produces two profits!

Send for Free Catalog and full information—NOW

See Our Exhibit at the New York Show



COX BRASS MFG. CO.
ALBANY, N. Y.

1777 Broadway, New York City.
3445 Michigan Ave., Chicago, Ill.
870 Woodward Ave., Detroit, Mich.
1216 Van Ness Ave.,
San Francisco, Cal.



Please mention The Automobile when writing to Advertisers.

**Hyatt Roller Bearings
carry the load on a line
contact instead of on one
point as ball bearings do.**

**A line is composed of an
infinite number of points
placed in a row.**

**Just think of the saving
in duty on the bearing
when the load is distrib-
uted along this line instead
of being concentrated on
a single point.**

"Hyatt Quiet Bearings"



**HYATT ROLLER BEARING Co.
DETROIT, CHICAGO
NEWARK, N.J.**

As sure as the Whirl of the World



AUTO-LITE
ELECTRIC STARTING and LIGHTING
SYSTEM

A Capable Starting Motor

SO rugged and powerful that it will spin a big six-cylinder automobile engine faster than 100 revolutions per minute with the ease of a Hercules and on less than 100 amperes of current, the Auto-Lite Starting motor can be relied upon to perform its function faithfully and fully—compelling positive starting day in and day out, winter or summer.

Strong—compact—capable—fully enclosed—protected from the deteriorating effect of water, dirt and grease, it is built for hard, continuous service and should last longer than the car to which it is attached.

Look for this efficient starter on your 1914 car.

The manufacturing and financial facilities of the Electric Auto-Lite Company are adequate to handle contracts of any size, not only for starters but for complete electric lighting and ignition systems as well.

An Explanation to Owners

While the complete Auto-Lite electric lighting system may be attached easily to the average car, it is more difficult to install a starting motor because space and structural limitations sometimes necessitate material alterations and considerable machine work before a satisfactory application can be made—hence orders from individual owners for starting motors are not solicited.

You can have the complete Auto-Lite equipment on your new car, however.

Manufacturers can furnish it if you so specify.

The Electric Auto-Lite Company

Toledo,

"The Pioneer Makers of the 6-Volt Electric System"

Ohio

Every Motorist should have a copy of the Auto-Lite Handbook on Automobile Electric Systems.

Explains in detail, functions of the various parts—how to locate and remedy troubles of all kinds—embraces all electrical automobile systems. The large operation chart which it contains is alone worth the price.

Regular price 50c.

Will be sent to you for 10c in stamps if you use the coupon.

Branches:

New York Kansas City
Detroit San Francisco

This Coupon Saves You 40 Cents

The Electric Auto-Lite Co.,
114 Michigan Street, Toledo, O.

Enclosed find 10c. in stamps for which please send me your handbook.

NAME

ADDRESS

Hupmobile



Grand Central Palace,
New York City,
January 3-10

Coliseum, Chicago,
January 24-31

"32" Touring Car or Roadster
\$1050 f. o. b. Detroit
In Canada, \$1230 f. o. b. Windsor factory

EQUIPMENT—Electric horn; rain vision, ventilating windshield; mohair top with envelope; inside quick adjustable curtains; speedometer; cocoa mat in tonneau; gas headlights; oil side lamps; trimmings, black and nickel.

With regular equipment and additional equipment of two-unit electric generator and starter; electric lights; oversize tires, 33 x 4 inches; demountable rims, extra rim and tire carrier at rear. \$1200 f. o. b. Detroit.
In Canada, \$1380 f. o. b. Windsor factory

HUPP MOTOR CAR COMPANY
1252 Milwaukee Ave., Detroit, Mich.
Canadian Plant, Windsor, Ontario

Haven't you found, in your travels, that a Hupmobile family in one town thinks and talks about the car exactly like a Hupmobile family in any other town?

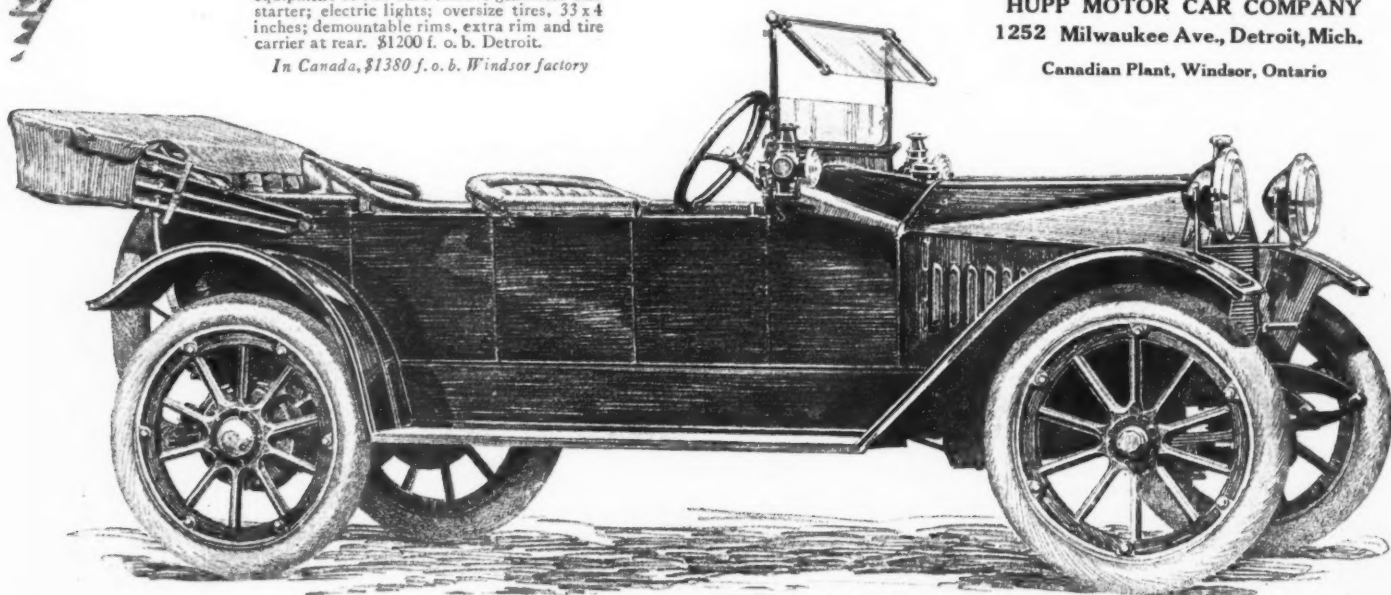
Isn't it one unbroken chain of kind thoughts and kinder words, from Montpelier to El Paso—in every nook and corner of the nation?

And what finer assurance can you have than this of value that is built deep down into the very vitals of the car?

We would rather have this country-wide good-will toward the Hupmobile than to sell a volume ten times as great on price alone.

We are trying to build every Hupmobile as though we were building only one—as though the one man who was to buy it must be satisfied at all hazards.

Isn't that better—to satisfy each one intensely and completely—than to sell twice or three times as many and please the buyers only half as well?



The car of The American Family

Please mention The Automobile when writing to Advertisers

Least Expensive in the Long Run



One broken spring will cost you in money, delay and annoyance far more than GOOD springs would have cost originally.

In five years not ONE CLEVELAND-CANTON CHROME-VANADIUM Spring was returned because of breakage or settling.

And this is due solely to the amazing strength and toughness put into these springs in the process by which they are made.

Instead of a single rolling, Cleveland-Canton Chrome-Vanadium Springs are cross-rolled, both *lengthwise* and *crosswise*.

This method, steel experts will tell you, cannot be improved upon in making automobile springs.

Cross-Rolled Chrome-Vanadium

"Not a Bump in One of Them"



"Built for Life-Long Endurance"

Don't be satisfied with ordinary springs, when you can get springs of such enduring quality as these.

Springs which shield the engine from shock and vibration, springs which make the car

last longer, springs which reduce the upkeep in a way you can trace.

Leading makers are using these springs by the thousands. You can learn all about them, if you write for our booklets and full information. Why not today?

Best Grade—Chrome-Vanadium

Next Best—Special Analysis

The Cleveland-Canton Spring Co.

Canton, Ohio, U. S. A.



THE NATIONAL AUTO SHOWS



Under Auspices of Automobile Chamber
of Commerce, Inc.

At NEW YORK
Grand Central PALACE

January 3 to 10

**One Show
One Building**

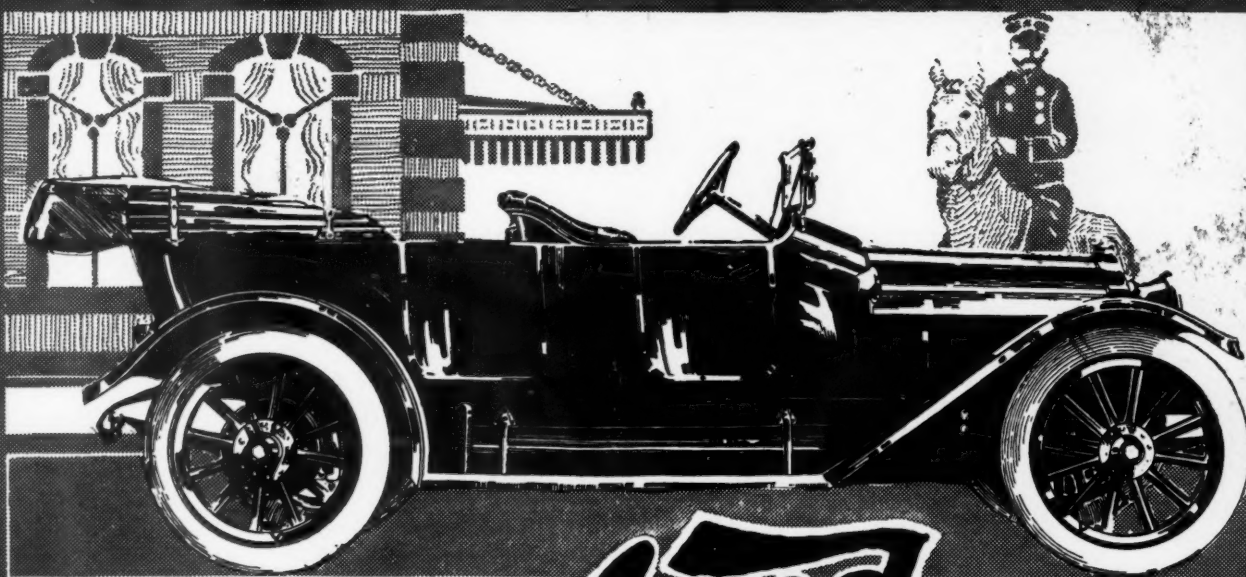
Passenger Cars—Motorcycles—Accessories

At CHICAGO, January 24 to 31
Coliseum and 1st Regiment Armory

Both Shows Bigger and Better Than Ever

S. A. MILES, *Manager*

7 East 42nd Street, New York City



Overland

\$950

Completely Equipped

With electric starter and generator—\$1075
Prices f. o. b. Toledo

Electric head, side,
tail and dash lights
Storage battery
35 Horsepower motor
114-inch wheelbase
33 x 4 Q.D. tires

Three-quarter floating
rear axle
Timken and Hyatt
bearings
Deep upholstery
Brewster green body

nickel and aluminum
trimmings
Mohair top, curtains
and boot
Clear-Vision
windshield

Cowl dash
Stewart speedometer
Electric horn
Flush U doors with
concealed hinges

THE Automobile Chamber of Commerce has awarded the Willys-Overland Company the position of honor at the New York Automobile Show which opens in the Grand Central Palace, January 3rd.

This is OFFICIAL recognition of Overland success and proof that we are doing the largest business.

Literature on request. Please address Dept. 38.

The Willys-Overland Company
Toledo, Ohio

Manufacturers of the famous Garford and Willys-Utility Trucks. Full information on request.

The Gateway to Success

for more than sixty firms that manufacture motor vehicles (of which but a few are here indicated), is keyed upon the solid reputation of

Continental Motors

It arches high and reaches wide. Upon a fundamental truth its foundations rest—that the specialist can build best and most economically.

And its courses have been laid in ten years of unqualified success—both financial and mechanical.

An association with the Continental Motor Mfg. Co. is today one of the most valuable assets that any motor car or truck builder can possess.

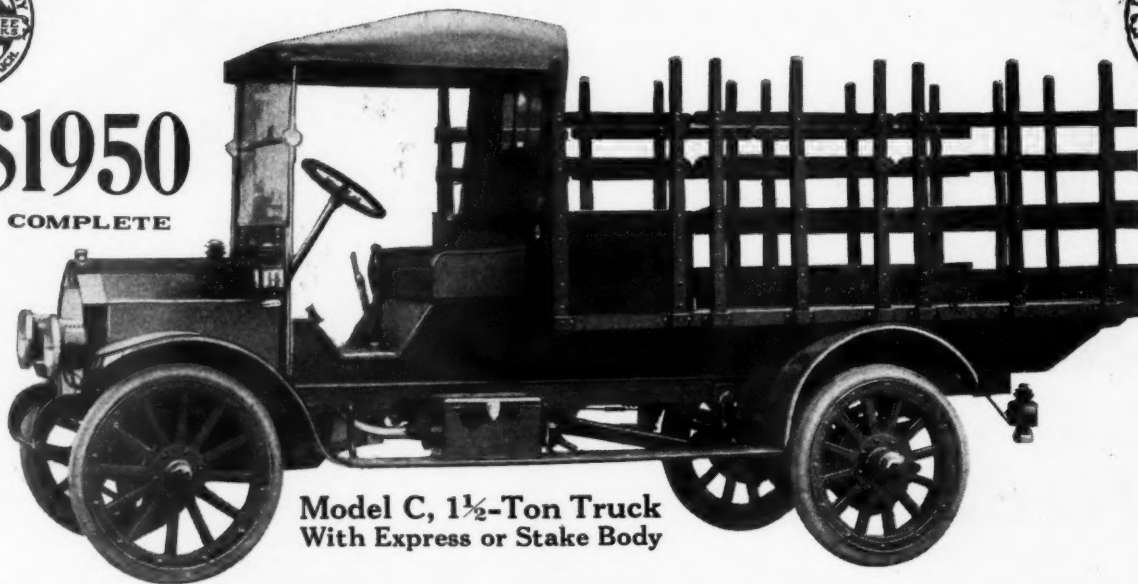
Such an association fortifies the manufacturer's sales, because it assures unquestioned motor service to every owner.

Continental Motor Mfg. Co.
DETROIT, MICHIGAN.
Factories—Detroit and Muskegon.

Please mention The Automobile when writing to Advertisers



\$1950
COMPLETE



Model C, 1½-Ton Truck
With Express or Stake Body

"The MENOMINEE" TRUCKS

FOR ECONOMY

THE MENOMINEE 1½-ton truck is especially designed for tradesmen in the heavier lines of business—brewers, wholesale manufacturers of all kinds, dairymen, expressmen, large department stores, and a score of others.

Dogged, 365-day-in-the-year service is built into this model down to the last tiny bolt. It is ruggedly constructed to withstand generous overloads. It is so simple and understandable that any driver can operate it. It holds the low up-keep record for trucks in its price class. Fill in and send us the attached coupon for complete information.

Note These Specifications

MOTOR: 35 H. P. 4-cylinder (4x5).
WHEELBASE: 122".
FRONT AXLE: I-beam 3x1 ¾ inches, drop forged.
REAR AXLE: Full-floating nickel steel live axle shafts. Double gear reduction.
CARBURETOR: Stromberg.
TRANSMISSION: In unit with motor. Selective type. 3 speeds forward, 1 reverse. Nickel steel driving shaft.
CLUTCH: Multiple dry discs.
LOADING SPACE: 120x60".
IGNITION: Bosch Magneto and batteries.
WHEELS: 36 inch artillery type.
TIRES: 36x4" front, 36x5" rear. Detachable, solid rubber.

CARRYING CAPACITY: 3000 pounds.
OILING SYSTEM: Automatic, and a combination of force and gravity feed.
SPRINGS: Front, semi-elliptic, 2 ½ x 42". Rear, platform 3-point suspension, 2 ½ by 40 inches.
FRAME: 4-inch heat-treated channel steel.
CONTROL: Hand levers located in center of car.
STEERING GEAR: Lavigne special truck gear.
RADIATOR: Vertical tube.
BRAKES: Internal expanding and external contracting.
EQUIPMENT: 2 gas headlights and generator, 2 side oil lamps, 1 tail lamp, horn, jack, and full kit of tools.

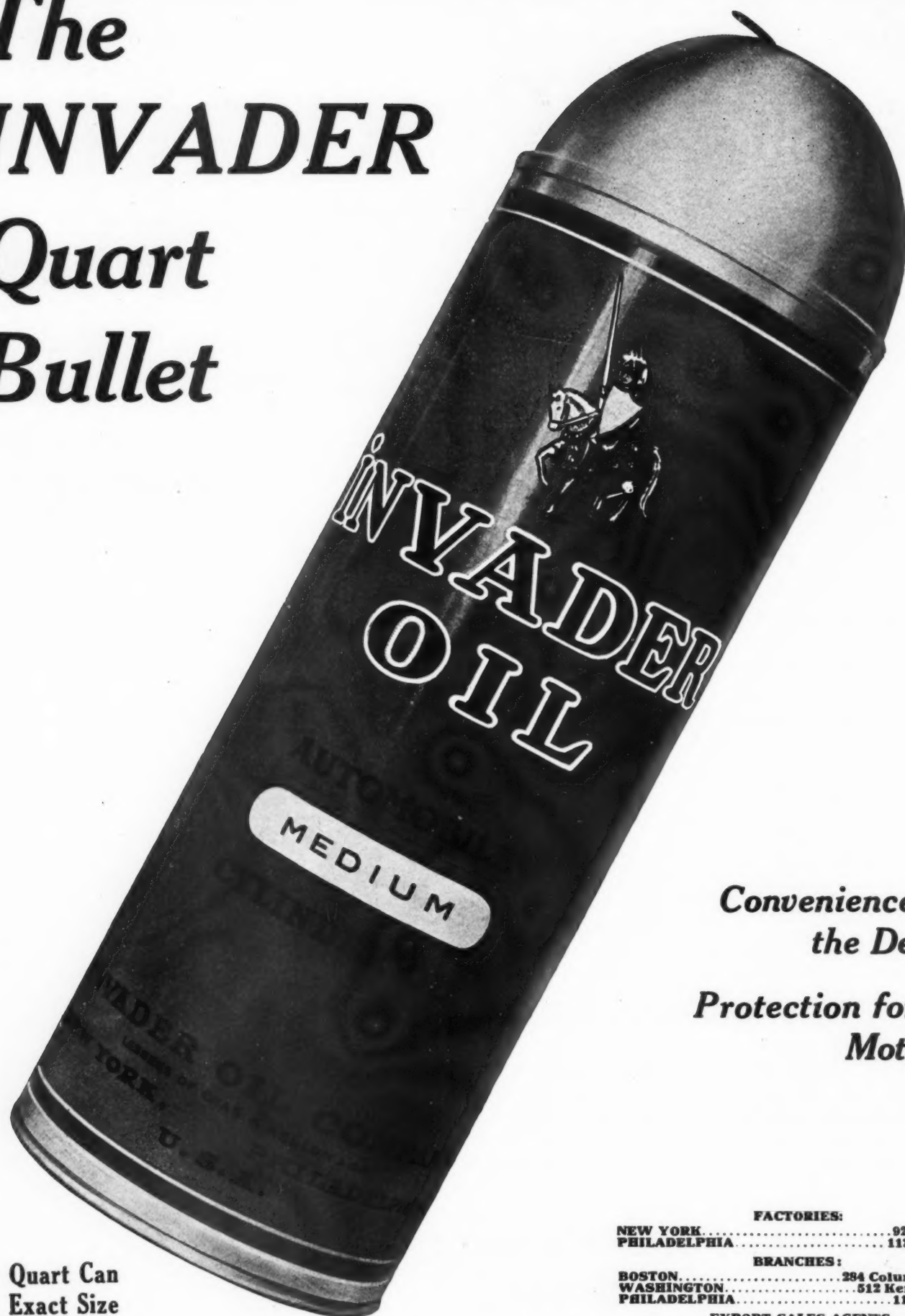
DEALERS: MENOMINEE 1500 lb. Trucks at \$1200, 1-ton trucks at \$1500, and 1½-ton trucks at \$1950, put a dealer in position to close with 90% of the truck prospects in his territory. We have some choice territory still open. We can make immediate deliveries. Write for generous agency proposition. Use the coupon.

D. F. Poyer Company
Menominee, Michigan



(COUPON)
D. F. POYER CO., Menominee, Mich.
Gentlemen, I am interested in "The MENOMINEE" Motor Truck.
Kindly send me complete information.
Name.....
Address.....
If a dealer check here. ☐

The INVADER Quart Bullet



Quart Can
Exact Size

*Convenience for
the Dealer*

*Protection for the
Motorist*

FACTORIES:

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PHILADELPHIA.....113 Arch St.

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Chipman Limited, 8-10 Bridge St., New York City

Please mention The Automobile when writing to Advertisers

INVADER OIL *will* leave a carbon deposit.
So will every other oil.

INVADER OIL *will* smoke when it burns.
So will every other oil.

When **INVADER OIL** is used it *may be* necessary to grind valves. Such certainly would be the case with every other oil.

A motor using **INVADER OIL** *can* overheat.
So it can when any other oil is used.

A machine exclusively lubricated with **INVADER OIL** *will* eventually wear out. This would also be the case no matter what oil was used.

INVADER OIL is *not* a perfect lubricant,—neither is any other oil. There is no such thing.

INVADER OIL, however, is chemically superior to all other oils. It will deposit *less* carbon,—make *less* smoke,—mean *less* grinding of valves,—make a motor *less* liable to overheat, and will cause the machine using it to last *longer* mechanically than would be the case were *any* other oil used.

Remember that the superiority which is indicated by its better tests is a superiority which cannot be contradicted. INVADER OIL is better because its tests are better. There is no way of avoiding this fact.

INVADER OIL COMPANY, Inc.

Lessees of Charles F. Kellom & Co.

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HB

Hess-Bright


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DWF




BALL BEARINGS



*The season's best
wishes go with
HESS-BRIGHT users
throughout the entire
year*

The HESS-BRIGHT MANUFACTURING CO.
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STORES FOR RETAIL DISTRIBUTION
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Please mention The Automobile when writing to Advertisers



The Bugs
are all
out of the



Storage Battery

At some stage of its adolescence, most every device is more or less bug ridden.

The LBA is no exception to the general rule—we admit, frankly, it had bugs at one time, though it was never so thoroughly infested as some of its contemporaries.

But when one knows where bugs exist and desires to be rid of them, they can be eradicated. If not cleaned out, they grow and thrive and multiply in true bug fashion.

We were well aware of the LBA bugs and we determined to make our storage batteries too hot for their residence.

It took some time, but today the LBA is bugless while some storage batteries are *bug houses*.

Don't Buy a Battery With Bugs In It!

The great majority of manufacturers do not like buggy batteries; that's why they have selected the LBA for their exclusive use with starting and lighting equipment.

WILLARD STORAGE BATTERY COMPANY

CLEVELAND, OHIO

New York Branch: 136 West 52d Street

San Francisco Branch: 243 Monadnock Bldg.

Indianapolis Branch: 438 and 439 Indiana Pythian Bldg.

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Service stations in all principal cities in the United States, Canada and Mexico

(79)

PACKARD SECURITY

The bridge builder's factor of safety is built into every Packard car.

Combined with luxury of motion—silence—certainty of performance—is durability far beyond the requirement.

Six-inch depth of frame is typical of the maximum service quality in Packard construction.

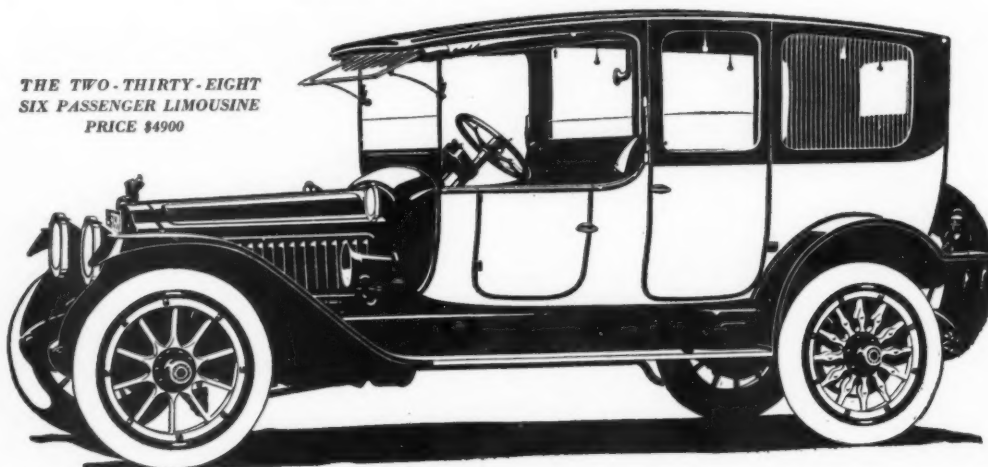
Packard cars demonstrate their supremacy at the time when stamina is most needed.

PACKARD MAXIMUM SERVICE QUALITIES
ARE EMBODIED ALSO IN PACKARD TRUCKS

PACKARD MOTOR CAR COMPANY, DETROIT

LINCOLN HIGHWAY CONTRIBUTOR

THE TWO-THIRTY-EIGHT
SIX PASSENGER LIMOUSINE
PRICE \$4900



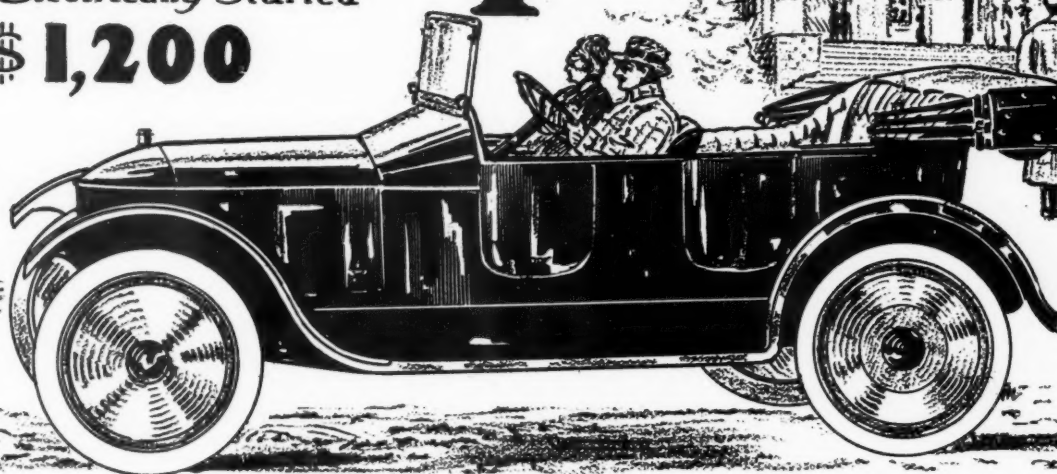
ASK THE MAN WHO OWNS ONE

CAMERON

"4"

Electrically Lighted
Electrically Started

\$1,200



Four Speed Direct Drive

Maximum power—minimum upkeep, coupled with simplicity in operation, are the keynotes of modern car building. All modern motor car improvements have been towards this end. For some time it has been an acknowledged fact, both by the public and engineers, that the proper drive is the four speed, and as a result many of the more expensive cars have adopted this form of transmission. However, utilizing as they have, the old-fashioned sliding gear transmission, their results have not been as successful as hoped for. Not until Mr. Cameron designed and patented the CAMERON FOUR-SPEED DIRECT-DRIVE TRANSMISSION was the problem solved.

The CAMERON (PATENTED) FOUR-SPEED DIRECT-DRIVE TRANSMISSION is absolutely the only type of transmission that permits of direct drive on every speed. Proven by severe tests on racing tracks, hill-climbing, and endurance meets, the Cameron transmission produces the only efficient and sensible connecting link between the engine and driving wheels, and positively gives twenty-five to thirty-five per cent. more efficiency over all other types.

With this style transmission, changing gears becomes simplified,

SPECIFICATIONS:

MOTOR:—Cast en bloc. Bore, 3 3/4" stroke, 5". Valves in center of combustion chamber, combustion chamber being directly over the center pistons, operated by enclosed rocker arms all on one side.

CLUTCH:—Inverted cone, self adjusting.

TRANSMISSION:—Cameron Patented four speeds forward and one reverse; direct drive on all speeds.

IGNITION:—High tension magneto.

LUBRICATION:—Self-contained in engine with pump.

WHEELBASE:—115".

REAR AXLE:—Cameron's full floating type.

FRONT AXLE:—Cameron's tubular.

SPRINGS:—Front, half elliptic; rear, full elliptic, with scroll ends.

WHEELS:—32" Artillery or wire, with demountable and flush hubs.

TIRES:—32 x 3 1/2 regular. Also 33 x 4 can be used.

BRAKES:—Internal expanding, both on rear wheels. Extra large brake drums.

STARTING:—Lighting. Electric—2 distinct units.

DRIVE:—Left-hand and center control.

DASH:—Cowl.

GASOLINE:—Tank in Cowl dash. Gravity feed. Capacity, 20 gallons.

RADIATOR:—Special design, pointed.

FINISH:—Very dark Royal blue.

UPHOLSTERY:—Buffed Leather. Deep Cushions.

WEIGHT:—1975 lb.

EQUIPMENT:—Mohair top, side curtains and top boot, windshield, speedometer, complete tool kit, tire repair outfit, pump and jack.

and all dangers of stripping gears by inexperienced operators eliminated.

Allowing the widest range of gearing, giving continuous driving on whatever speed best suited to load and road conditions added to the fact that its engine gives the largest percentage of power to the rear wheels on all speeds, makes the CAMERON car in these days of high cost of fuel, the leader.

The CAMERON CAR for 1914 typifies everything that goes to make motoring a pleasure. The sturdiest, best constructed and most economical car built in America.

A car that is built complete under one roof, and by one complete organization. Mr. Cameron designed the car complete, our own forges turned the crude material, our own skilled mechanics assembled the parts in entirety.

Only in such a manner could such a car be produced, at such a price.

Everything that pertains to motoring comfort has been incorporated into its make-up. Started and lit by electricity, it is driven from the left side, with the control centrifuged. The long-stroke, flexible motor, its long wheel-base, gives a riding pleasure heretofore unknown.

Fully equipped with every requisite \$1200

The Cameron Mfg. Co., New Haven, Conn.

Space C-16—Third Floor—Grand Central Palace, New York

Here's a "Four" with more POWER than a "Six"

\$2400 **MOLINE-KNIGHT** **\$2400**

Nothing Extra to Pay *Completely Equipped*

More Power—More Flexibility—More Economy—More Silence

No other dealer can compete with you on this Greatest Knight Motor

Power without noise—speed without jolt

Knight Engine leads in Europe

The twenty-five foremost cars in Europe today are Knight motored. No matter what type of the old style poppet valved engine you are selling, your competitors have a poppet valved engine built on the same principle—so you are compelled to put up a pretty stiff argument why the prospect should buy a car from you instead of from the man across the street.

Smashes competition

With the greatest Knight Motor on your salesroom floor—the Moline-Knight—you can forget competition and spend your time making SALES—you will have something NEW to talk about—something different—indisputable arguments—that will bring you profitable SALES. Your profits will not be spent in service afterwards.

Sells without argument

Motorists who have demanded Sixes with more power and flexibility will buy the Moline-Knight. And those who have wanted Fours with low cost of upkeep will buy the Moline-Knight, too.

At least investigate this big, roomy, five-passenger, four-cylinder, 128-inch wheel base, guaranteed 50 B. H. P. electrically equipped Moline-Knight—the car that anticipates the requirements of your trade.

Write quick

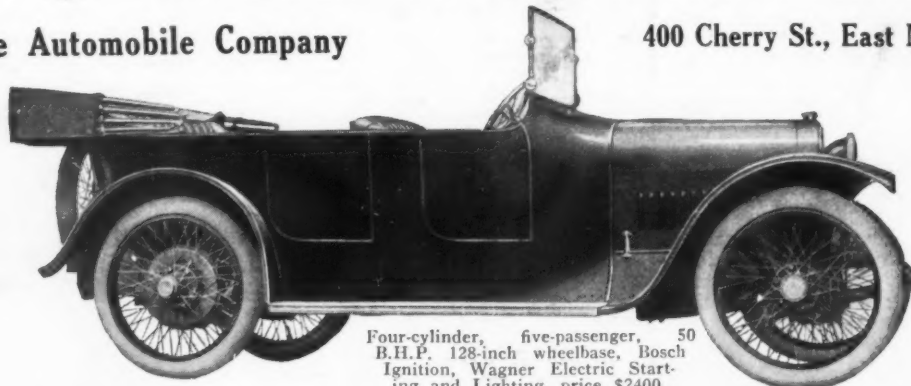
Write at once for our Advance Information Folder—it contains description, specifications and illustrations. In requesting Advance Folder you promise nothing, obligate yourself in no way—so write today.

See the Moline-Knight at the big Auto Shows

—get in communication with us before our output is allotted.

Moline Automobile Company

400 Cherry St., East Moline, Ill.



Four-cylinder, five-passenger, 50 B.H.P. 128-inch wheelbase, Bosch Ignition, Wagner Electric Starting and Lighting, price \$2400. Wire Wheels Extra.

The "Four" that makes the "Six" unnecessary

MOLINE KNIGHT

